2.0 Description of the Proposed Action and Alternatives

The Secretary plans to act on Liberty's Deepwater Port License Application to construct, own, and operate a deepwater port for the importation of liquefied natural gas (LNG) and sendout of natural gas. The proposed Port Ambrose Deepwater Port (Port Ambrose Project, Port or Project) would be located approximately 16.1 nautical miles off of Jones Beach, New York, approximately 27.1 nautical miles from the entrance to New York Harbor, 13.1 nautical miles east of Sandy Hook, New Jersey, and approximately 24.9 nautical miles from Long Branch, New Jersey. The proposed Port facilities would consist of two submerged turret loading buoy (STL Buoy) systems, buoy mooring system, buoy pick-up system, buoy landing pad, flexible riser and umbilical, and the pipeline end manifold (PLEM). The pipeline facilities would consist of two pipeline laterals, a collocated "Y" assembly (CYA), the proposed Mainline, and the subsea tie-in (SSTI) assembly. The STL Buoys would be designed to act as moorings for the purpose-built LNG regasification vessels (LNGRVs) and be the receiving connection for the natural gas unloaded from the LNGRVs and delivered to the proposed Mainline. The proposed Mainline would then connect to Transco's Lower New York Bay Lateral for delivery to shore.

The following sections present a detailed description of the design, construction, operation, and decommissioning of the proposed Project (Section 2.1); and an analysis of deepwater port alternatives, including the No Action Alternative (Section 2.2).

2.1 Detailed Description of the Proposed Action

2.1.1 Overview of the Proposed Port Ambrose LNG Deepwater Port

The general location of the proposed Port Ambrose Project is depicted in Figure 1.1-1. The proposed Port facilities would be located in federal waters of the North Atlantic in the Outer Continental Shelf (OCS) blocks NK 18-12 6708, NK 18-12 6709, and NK 18-12 6758 lease area, approximately 16.1 nautical miles off of Jones Beach, New York and 27.1 nautical miles from the entrance of New York Harbor. The STL Buoys would be located in water depths ranging from approximately 100 to 110 feet and separated by approximately 1.62 nautical miles to allow the LNGRVs to weathervane simultaneously without interference and provide for sufficient room for LNGRV maneuverability docking at a vacant buoy when an LNGRV is moored to the second buoy. Each STL Buoy would be permanently secured with eight mooring lines connected to suction anchors. A flexible riser would connect the STL Buoys to the PLEM, which in turn would connect to a pipeline lateral. When not in use, the STL Buoys would be lowered to a landing pad on the seafloor.

The proposed Mainline and pipeline laterals for the proposed Project would be located in both federal and state waters. The pipeline laterals would connect from the PLEM to the CYA. At the CYA, the two laterals would then connect to the proposed Mainline (Figure 2.1-1). The lateral on the southwest portion of the proposed Port facilities (Lateral 1) would be 26 inches in diameter and would run from the STL Buoy 1 (southwestern buoy) PLEM approximately 0.76 nautical mile in a northerly direction to the CYA. The lateral on the northeast portion of the proposed Port facilities (Lateral 2) would also be 26 inches in diameter and would run from the STL Buoy 2 (northeastern buoy) PLEM approximately 1.54 nautical miles in a westerly direction to the CYA. The proposed Mainline (pipeline) would extend from the CYA (milepost [MP] 0.00) in a northwesterly direction for approximately 16.8 nautical miles to where it would cross into New York state waters. From there it would continue approximately 2.3 nautical miles in a northwesterly direction to its terminus (MP 21.67) at the Transco Lower New York Bay Lateral connection.

LNGRVs that would call on the proposed Port facilities would be purpose built to call on STL Buoys. Liberty anticipates that the LNGRVs would be registered under the Norwegian International Ship Register through a long-term agreement with Höegh LNG.

The LNGRVs would approach the proposed Port facilities from the south using the Hudson Canyon to Ambrose Traffic Lane. The LNGRVs would be anticipated to be either the membrane or Moss (spherical) type and would be 145,000 cubic meters. A specially designed mating cone would be incorporated into the LNGRVs' design to facilitate connection of the LNGRVs to the STL Buoys. The STL Buoys would serve as the primary mooring structure for the LNGRVs and would allow for the LNGRVs to rotate around the STL Buoys, or weathervane, in response to prevailing wind, wave, and current directions. The LNGRVs would be equipped to vaporize its LNG cargo to natural gas through the onboard closed-loop, shell-and-tube vaporization system. When offloading and sendout operations are completed, the LNGRVs would disconnect from the STL Buoys and depart using the Ambrose to Nantucket Traffic Lane.

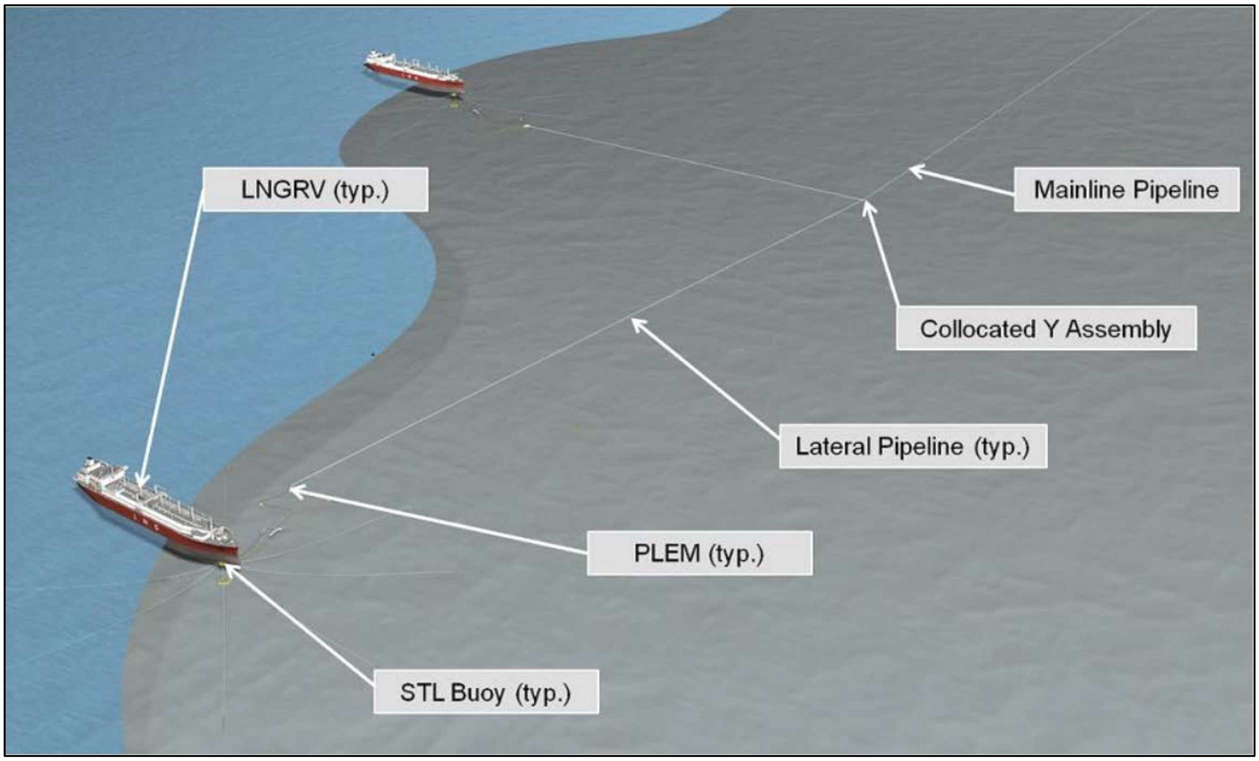

Figure 2.1-1. Proposed Port Ambrose Facilities Connection

The proposed Project would be designed to transport a nominal annual average of 400 million standard cubic feet per day (MMscf/d) of natural gas (peak of 650 MMscf/d for one STL Buoy). Typically, only one pipeline lateral would be operating. With only one pipeline lateral, the proposed Project would still be able to independently deliver at the 400 MMscf/d average rate or a peak rate of 650 MMscf/d. With two STL Buoys in operation, the maximum peak sendout would be 660 MMscf/d.

2.1.2 Lease Blocks and Overall Site Plan

The proposed Project would be located in federal waters of the North Atlantic within the Protraction New York (NK 18-12) lease area. The proposed Port facilities, including the pipeline laterals, would be located in the OCS block NK 18-12 6708, NK 18-12 6709, and NK 18-12 6758 lease areas. The proposed Mainline would be located in the OCS block NK 18-12 6708, NK 18-12 6658, NK 18-12 6657, NK 18-12 6607, NK 18-12 6606, NK 18-12 6556, NK 18-12 6555, NK 18-12 6654, NK 18-12 6504, and NK 18-12 6503 lease areas. These are the only lease blocks where impacts on the seabed would occur. All other lease blocks associated with the proposed Project would be associated with LNGRV and support vessel transit. LNGRVs would approach the proposed Project from the south via the Hudson Canyon to the Ambrose Traffic Lane and depart via the Ambrose to Nantucket Traffic Lane. The support vessel would depart from the chosen onshore facilities location and would travel through New York state waters before entering U.S. federal waters to reach the proposed Project site. A detailed summary of lease blocks where the proposed Project facilities would occur is provided in Table 2.1-1 and depicted in Figure 2.1-2. The proposed Project Mainline alignment is depicted in Figure 2.1-3.

Table 2.1-1. Lease Block Information

Project Facility	OCS Area	OCS Lease Blocks
STL Buoy 1 (Southwestern Buoy)		
STL Buoy	NK 18-12	6708
PLEM		6708
Flexible Riser		6708
Anchor Piles		6708, 6709, 6758
Lateral 1		6708
STL Buoy 2 (Northeastern Buoy)		
STL Buoy	NK 18-12	6709
PLEM		6709
Flexible Riser		6709
Anchor Piles		6709
Lateral 2		6708, 6709
Other Facilities		
CYA	NK 18-12	6708
Proposed Mainline		6708, 6658, 6657, 6607, 6606, 6556, 6555, 6554, 6504, 6503

2.1.3 LNG Regasification Vessels

The LNGRVs that would call on the proposed Port facilities would be purpose-built for the proposed Project. Liberty anticipates that the LNGRVs would be registered under the Norwegian International Ship Register through a long-term agreement with Höegh.

The LNGRVs would be the membrane type (Figure 2.1-4) with a total cargo capacity of 145,000 cubic meters. The designed maximum sendout rate for the LNGRVs would be 750 MMscf/d with the average annual sendout rate estimated at 400 MMscf/d. The cargo tanks would be located in the inner hull, while the outer hull would be used for seawater ballast. A detailed discussion on the LNGRVs' closed-loop system is provided in Section 2.2.1.4. The LNGRVs would have a range of 12,000 nautical miles at an approximate speed in calm weather of 19.5 knots.

The LNGRVs would have a double-hull arrangement with a raked stem with a bulbous bow, a transom stern, and a continuous upper deck. The deck aft would be sunken. Located aft would be the engine room, accommodation area and bridge. The LNGRVs would have two bow thrusters forward and two stern thrusters aft for maneuverability, port facility operations, and as necessary to prevent tank sloshing. Forward of the four LNG storage tanks would be the trunk and STL Buoy compartment with the mating cone for STL Buoy mooring. The approximate dimensions and capacities of the LNGRVs would be as follows:

- Length overall: 918.6 feet
- Length between perpendiculars: 885.8 feet
- Breadth molded: 144.4 feet
- Design draft: 37.4 feet
- Cargo tank capacity: 145,000 cubic meters
- Ballast water tanks: 4,660,000 gallons
- Marine low-sulfur diesel oil tanks: 1,558,800 gallons
- Gas oil tanks: 63,000 gallons
- Distilled water tanks: 74,000 gallons
- Freshwater tanks: 66,000 gallons
- Potable water tanks: 53,000 gallons
- Urea tanks: 10,100 gallons
- Mercaptan tank: 2,000 gallons

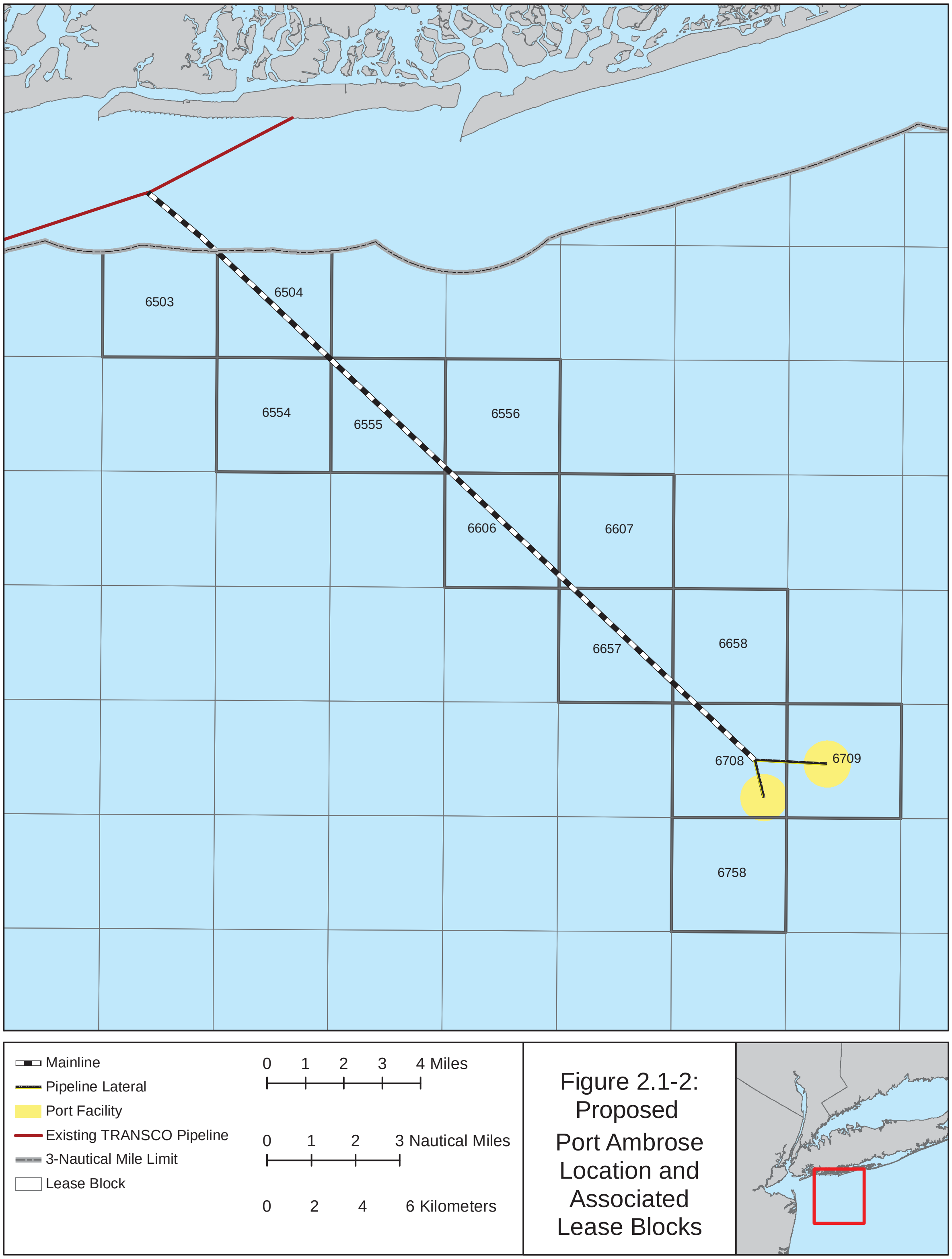

Figure 2.1-2. Proposed Port Ambrose Location and Associated Lease Blocks

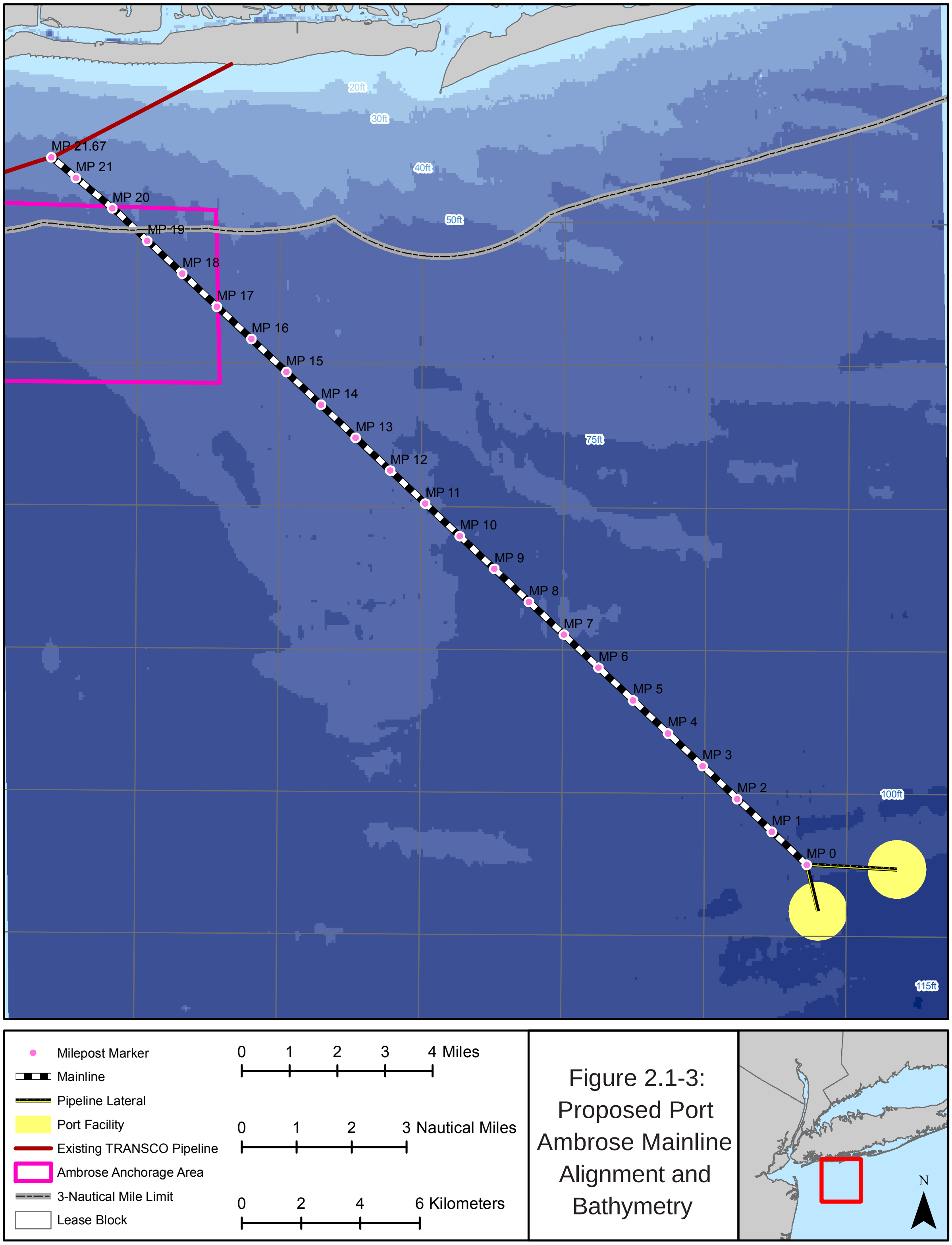

Figure 2.1-3. **Proposed Port Ambrose Mainline Alignment and Bathymetry**

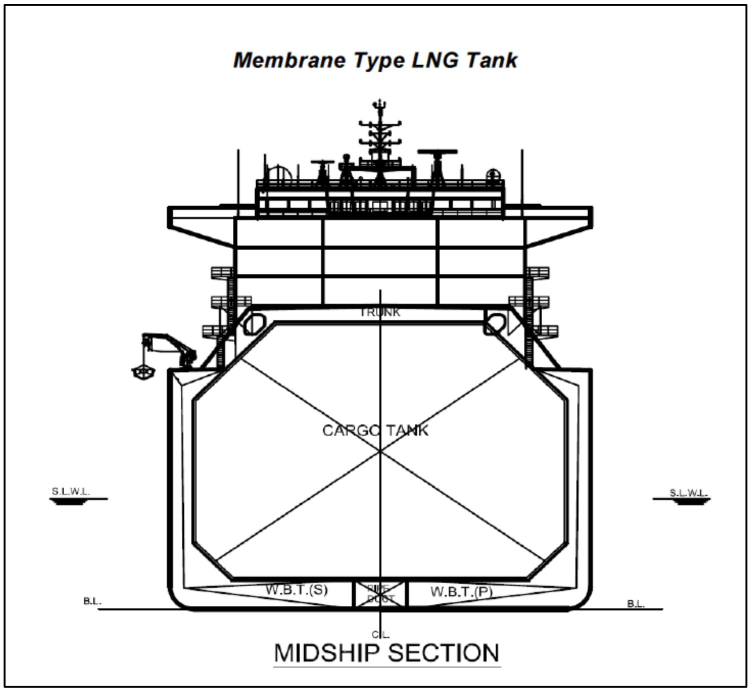

Figure 2.1-4. Membrane Type LNGRV

2.1.3.1 LNGRV Containment System

The LNGRVs' cargo tanks would be designed to comply with the International Maritime Organization (IMO) requirements in accordance with the 25-year North Atlantic or 40-year worldwide vessel design life. The inner hull would contain the four cargo tanks and insulation barrier. The LNG would be stored at minus 261 degrees Fahrenheit (°F) with an LNG inlet temperature of minus 256°F and a minimum gas outlet temperature of 40°F. The maximum daily boil-off rate would be 0.155 percent of the cargo capacity.

2.1.3.2 LNGRV Propulsion and Electrical Power Generation

Propulsion for the LNGRVs would be provided by two electric motors directly coupled to a single fixed pitch propeller. Four dual-fuel diesel engine generators would power the electrical generating plant. The main fuel source for the dual-fuel diesel engines would be boil-off gas (BOG) or vaporized gas; however, at low speeds (low engine loads) the fuel source would automatically switch to low-sulfur marine diesel oil. The dual-fuel diesel engines would burn 99 percent BOG or vaporized gas and one percent low sulfur marine diesel oil while re-gasifying at the proposed Port facilities.

The shaft horsepower would be approximately 35,000 horsepower and would be able to achieve a speed of 19.5 knots on even keel at design draft in calm weather. The propulsion system would be controlled from the bridge during open ocean transit and from the engine control room prior to and during maneuvering conditions. A single Schilling or Becker type high-lift rudder would be used for enhanced maneuvering. The steering machinery would be an electrically or hydraulically driven rotary vane.

2.1.3.3 LNGRV Maneuvering and Positioning

The LNGRVs would have dynamic positioning (DP) thrusters for fine adjustments. This thruster control system would consist of two tunnel thrusters forward and two tunnel thrusters aft. A specially designed software program would assist in STL Buoy mooring. The thrusters would have a controllable pitch propeller and be controlled with a joystick at the bridge and bridge wings.

To monitor the STL Buoy's draft and position prior to and during connection/disconnection with the LNGRV, each LNGRV would feature an acoustic position reporting system. This system would automatically search for the strongest signal from the three transponders located on each STL Buoy or the additional transponder located on the PLEM. The LNGRVs would also feature a DP system. The DP system would be a Class 1 system and used while retrieving the submerged STL Buoy messenger line and positioning the LNGRV onto the STL Buoy.

2.1.3.4 LNGRV Mooring System

The STL Buoy would serve as the mooring system while the LNGRVs are connected. The connection would be such that the LNGRVs would be able to swivel or rotate (weathervane) about the axis of the STL Buoy. The STL Buoy mooring system is discussed below in Section 2.1.6.2. Under certain metocean conditions where cargo sloshing may occur, stern thrusters would be used to align the LNGRVs into the oncoming seas while moored. In addition to the STL Buoy mooring, each LNGRV would have conventional mooring equipment, including port and starboard anchors.

2.1.4 Operations

Prior to LNGRV arrival at the proposed Port facilities, the support vessel would inspect the STL Buoy messenger line and marker buoys. In addition to these inspections and normal Port facilities' security functions, the support vessel would perform weekly inspections of the surface components. These inspections would take place during the transportation of personnel/supplies to the LNGRVs at the proposed Port facilities or while attending to specific needs of the proposed Port facilities.

The LNGRVs would approach the proposed Port facilities from the south using the Hudson Canyon to the Ambrose Traffic Lane and depart using the Ambrose to Nantucket Traffic Lane. Liberty has prepared a draft Operations Manual for the proposed Project. The Operations Manual covers all aspects of port operations. Once the LNGRVs arrive at the proposed Port facilities, their function would be to regasify the LNG in their cargo tanks and deliver natural gas to the proposed Mainline.

When arriving at the proposed Port facilities, the LNGRVs would use a grapnel hook to recover the capture line from the sea surface buoys. A winch would begin to pull the STL Buoy up from the seafloor toward the turret compartment. The flexible riser and umbilical would also be raised with the mooring chains and cable during this procedure. Once retrieved, the STL Buoy would be brought into the turret compartment and locked in-place. The LNGRV would then vaporize the LNG using the onboard closed-loop shell and tube regasification system, and deliver natural gas to the proposed Mainline.

The LNGRVs would be held in position by the STL Buoys through the mooring lines secured to anchor points located on the seabed. The proposed Port facilities natural gas output, weather considerations, and other variables would determine the duration to unload the 145,000-cubic meter LNGRVs; however, it would be anticipated that the duration to unload a single LNGRV would be 5 to 16 days. With a two STL Buoy system, it would be anticipated that while one LNGRV is unloading, another would be in transit or in the process of mooring to the other STL Buoy. Once fully unloaded, the LNGRV would disconnect from the STL Buoy and depart to reload its cargo. With this method, the proposed Project would receive up to 45 LNGRVs per year.

2.1.5 Vaporization and Process Facilities

LNG vaporization for the proposed Project would be completed through a two-step "closed-loop" shell-and-tube vaporization system. The closed-loop system would use a re-circulated water-glycol mixture as an intermediate heat medium, heated by steam generated by two auxiliary boilers on the LNGRV. BOG would fire the auxiliary boilers (Figure 2.1-5). Approximately 2.5 percent of each LNGRVs LNG cargo would be consumed during the process.

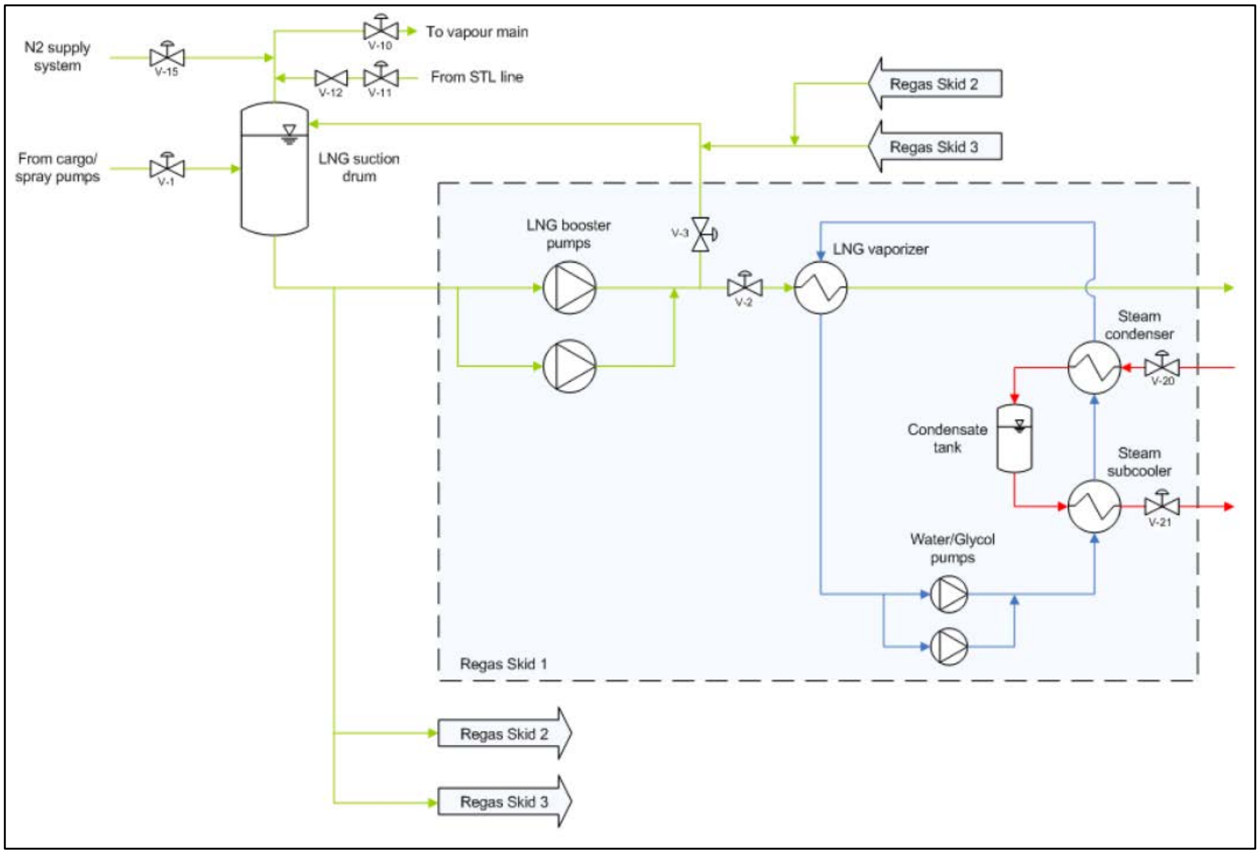

Figure 2.1-5. LNGRV Regasification Plant Components

2.1.5.1 Cooling and Ballast Water

Cooling water discharges could occur during the commissioning period (up to 45 days per LNGRV) because of limited operation of the regasification system, re-circulated ballast water may not be a reliable means to meet the LNGRV's cooling water needs over such a long time period. Ballast tank flushing may also be required during initial commissioning. It is expected that up to 8.2 million gallons per day of seawater could be used in a once-through mode to supply the LNGRV's dump condenser when gas sendout is low and/or interruptible. If the once-through mode was required, discharge of the cooling water would be through an outlet pipe located on the bottom of the LNGRV, approximately 37 feet below the waterline.

As LNG is vaporized and offloaded from the LNGRV via the proposed Mainline system, the LNGRVs would intake seawater (ballast water) through sea chests to maintain draft and stability. Ballast water intake rates would vary during the offloading process; however, the average ballast water intake rate would be 1.93 million gallons per day (1,338 gallons per minute [gpm]). The ballast water would be stored in tanks located in the LNGRVs' double hull. Ballast water would also be re-circulated for use in cooling the LNGRVs' engines and for other cooling and auxiliary purposes.

There would be no discharge of ballast water or cooling water during normal operation of the proposed Port facilities. The LNGRVs would also be equipped with enough storage to eliminate the need to discharge sanitary (black water) or hotelling (gray water) water while the LNGRV is on the STL Buoy.

2.1.5.2 Planned and Unplanned Maintenance and Repair

During operation of the proposed Port facilities, both planned and unplanned maintenance activities and repairs would be expected. Routine maintenance would generally be of shorter duration, lasting several days or less. Activities that would be considered routine maintenance would include attaching/detaching and/or cleaning the buoy pick-up line; performing surveys and inspections with a remotely operated vehicle (ROV); and cleaning or replacing parts (e.g., bulbs, batteries, etc.) on the floating navigation buoys. Every seven years, an intelligent pig would be used to assess the condition and integrity of the proposed Mainline and pipeline laterals.[17] This particular routine maintenance activity would take several weeks to complete and require several large construction-type vessels.

Unplanned repairs, whether major or minor, cannot be predicted. Minor repairs could include fixing flange or valve leaks, replacing faulty pressure transducers, or repairing a stuck valve. Minor repairs such as these would only require one diver support vessel and may only take a few days to complete. Major repairs, on the other hand, would likely require large construction vessels mobilized from local ports. Generally, upfront planning, equipment procurement, and mobilization of vessels and possibly saturation divers would be required for major repairs. Major repairs could include damage to the riser or umbilical line and the need to replace; damage to the proposed Mainline system and manifolds; or anchor chain replacement. These types of repairs could take two to four weeks or longer to complete.

2.1.6 STL Buoys and Mooring System

The STL Buoy components would consist of the STL Buoy, buoyancy cone, integrated turret, pick-up assembly, and landing pad. It is expected that for each STL Buoy, the mooring system and landing pad would permanently displace approximately 1.6 acres of sea floor, totaling 3.2 acres (Table 2.1-2). The STL Buoys would also function as the mooring system for the LNGRVs.

Table 2.1-2. Summary STL Buoy and Mooring System Seabed Impacts

Description	Quantity	Unit Impact (feet)	Total Impact (acres)
STL Buoy 1			
Tether System	1	2,900	0.1
Anchor Chain and Wire Impact Area	8	7,800	1.4
Landing Pad	1	2,000	0.1
STL Buoy 2			
Tether System	1	2,900	0.1
Anchor Chain and Wire Impact Area	8	7,800	1.4
Landing Pad	1	2,000	0.1
		Total Permanent Impacts	**3.2**

2.1.6.1 STL Buoys

Each STL Buoy would be 33 feet in height and 24 feet in diameter (Figure 2.1-6). The STL Buoys would be oriented southwest to northeast and be separated by approximately 1.62 nautical miles to allow the LNGRVs to weathervane without interference when simultaneously moored and provide for sufficient room for LNGRV maneuverability docking at a vacant buoy when an LNGRV is moored to the second buoy. The STL Buoys would be held in-place with eight mooring lines attached to suction anchors.

[17] DOT 192.939 defines the maximum inspection interval as seven years.

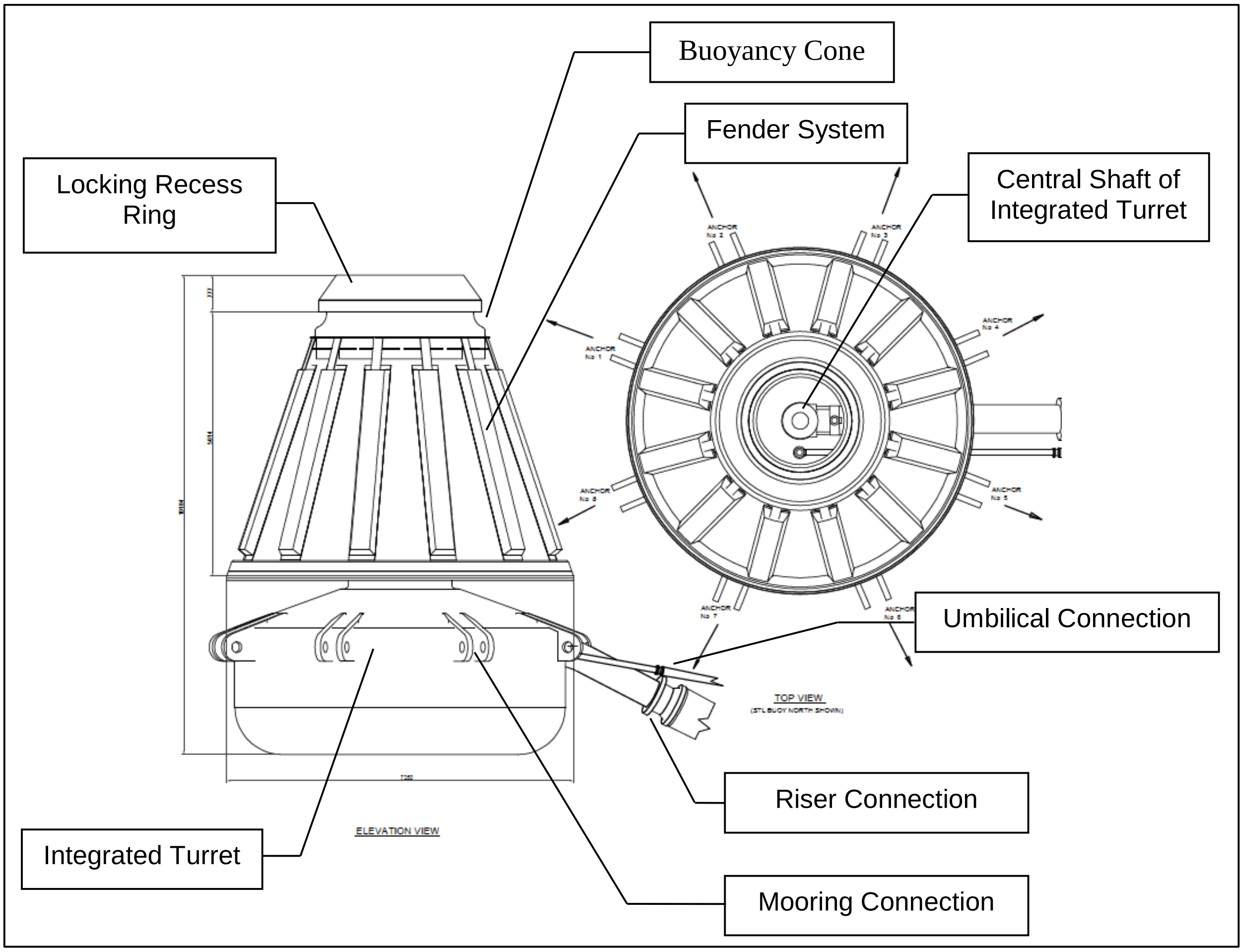

Figure 2.1-6. STL Buoy Components

Each STL Buoy would have a conical steel structure called a buoyancy cone. The buoyancy cone is designed to reduce the weight of the STL assembly to ensure a smooth transfer of mooring, riser, umbilical, and reaction forces to the LNGRV. The outer shell would be equipped with a heavy duty fender system to absorb impact loads during mating with the LNGRVs. The buoyancy cone would also be equipped with a locking recess ring and cams that would serve as vertical support to the STL Buoy and provide protection for an emergency shutdown (ESD) valve and male connector located on the STL Buoy. Lifting and pull-in pad-eyes would also be integrated into the top of the structure.

The integrated turret would be the geo-stationary component of the STL Buoy. The lower section would be fitted with mooring connections (pad-eyes) and connection points for the flexible riser and umbilical, and an upper central shaft section that would extend up through the center of the buoyancy cone and locking recess ring. Tension from the mooring system would be transferred to the turret through the pad-eyes connected via a double-lug connecting link. The connection link would be pinned using self-lubricating bushings and be designed to allow pivoting through multiple axes. A set of axial and radial bearings would be the interface between the turret and buoyancy cone, allowing the buoyancy cone and LNGRV to weathervane around the geo-stationary turret. The three main bearings on the turret would include an upper axial bearing and upper radial bearing, fitted into the housing of the locking recess ring on top of the buoyancy cone, and a lower radial bearing, fitted into the housing in the lower ring of the buoyancy cone. The bearings would be assembled in segments with self-lubricating bearings.

The top of the STL Buoy would be fitted with a pick-up assembly designed to facilitate retrieval of the STL Buoy from the landing pad. The pick-up assembly would consist of three main components: the three-leg lifting bridle; messenger line with spring buoys; and marker buoys. All of these components together would be approximately 525 feet in length. The STL Buoy would be connected to the messenger line with the three-leg lifting bridle. The messenger line would be fitted with spring buoys as supplemental flotation, as well as one finger buoy and one marker buoy with a flashing light. The finger buoy and marker buoy would be attached to the upper end of the messenger line and be at the surface when the STL Buoy is disconnected.

The STL Buoys would rest on landing pads installed on the seafloor when not in use. The approximately 49-foot-diameter landing pads would be installed to the seafloor using a skirted mud mat or, if necessary, suction anchor. To minimize impact loads while lowering the STL Buoys, fenders would be attached to the landing pad.

2.1.6.2 Mooring System

Eight mooring lines would be connected to the suction anchors for each STL Buoy (Figure 2.1-7). If necessary, driven piles could be used as an alternative to the suction anchors in the unlikely event geotechnical conditions preclude use of suction anchors (see Section 2.2.1.4). The mooring lines would be two chain segments (upper and lower) and two wire segments (upper and lower). The lower chain segment would be attached to the pad-eye on the suction anchor and the opposite would connect to the lower wire segment. The upper chain segment would connect to the turret connecting link and the upper wire segment. The steel cable segments would be approximately 4.25 inches in diameter and made of sheathed spiral strand wire. Maximum load on chain segments would occur when an LNGRV is moored to the STL Buoy. The chain segments would be designed for a service life of 30 years and 10-year return period wind and wave event. The mooring system would also be designed for a 100-year return period current event and a 100-year storm event while the STL Buoy is idle. From the center of the STL Buoy to the center of each anchor would be up to approximately 3,138 feet. Final design will account for prevailing current and wind and wire cable length may be less.

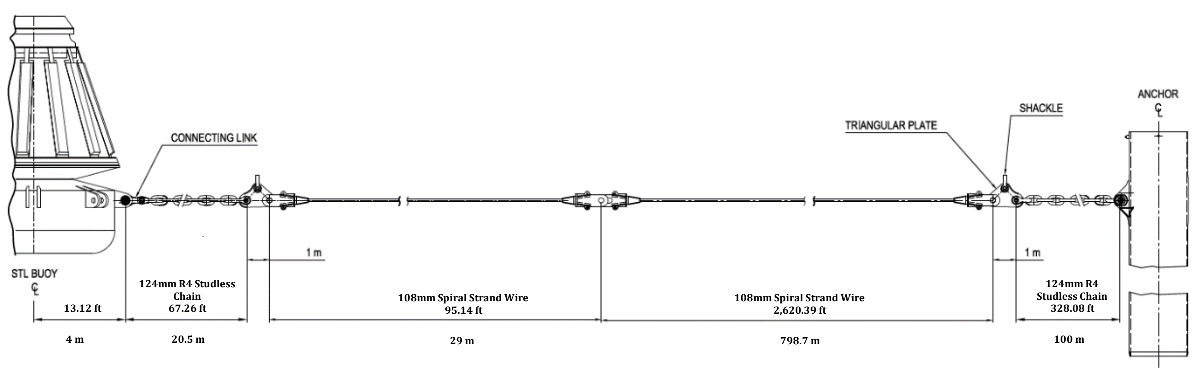

Figure 2.1-7. STL Buoy Mooring System

Eight suction anchors, approximately 26 to 46 feet in outer diameter and 33 feet in length (size is variable and dependent on geotechnical conditions), would be used to secure each STL Buoy. If necessary, driven piles could be used as an alternative to the suction anchors in the unlikely event geotechnical conditions preclude use of suction anchors. The mooring chain would be shackled to the pad-eye at the anchor pile and the vertical elevation of the pad-eye optimized with respect to the moment capacity of the sediment. The suction anchors would be designed to allow the LNGRVs to maintain station without the use of power, other than brief periods of stern thruster use under certain metocean conditions to prevent cargo sloshing.

2.1.7 Flexible Riser and Umbilical

The riser would be a 14-inch-diameter, flexible, high-pressure natural gas transfer hose that would connect the STL Buoy to the PLEM. The riser would be designed to handle the dynamic loading associated with raising and lowering the STL Buoys (Figure 2.1-8).

Parallel to the riser connecting the PLEM controls to the system controls on the LNGRV would be a separate control umbilical. Hydraulic lines within the umbilical would operate the ESD valve on the PLEM, provide control lines for pressure transmitters, and receive signals that identify the position and status of the ESD valve.

A holdback tether line would be connected to the flexible riser and umbilical to provide stability to their floating components. The holdback tether would be connected to a 220-ton clump weight tether anchor. The holdback tether line would be approximately 2,946 feet from the riser to the tether anchor.

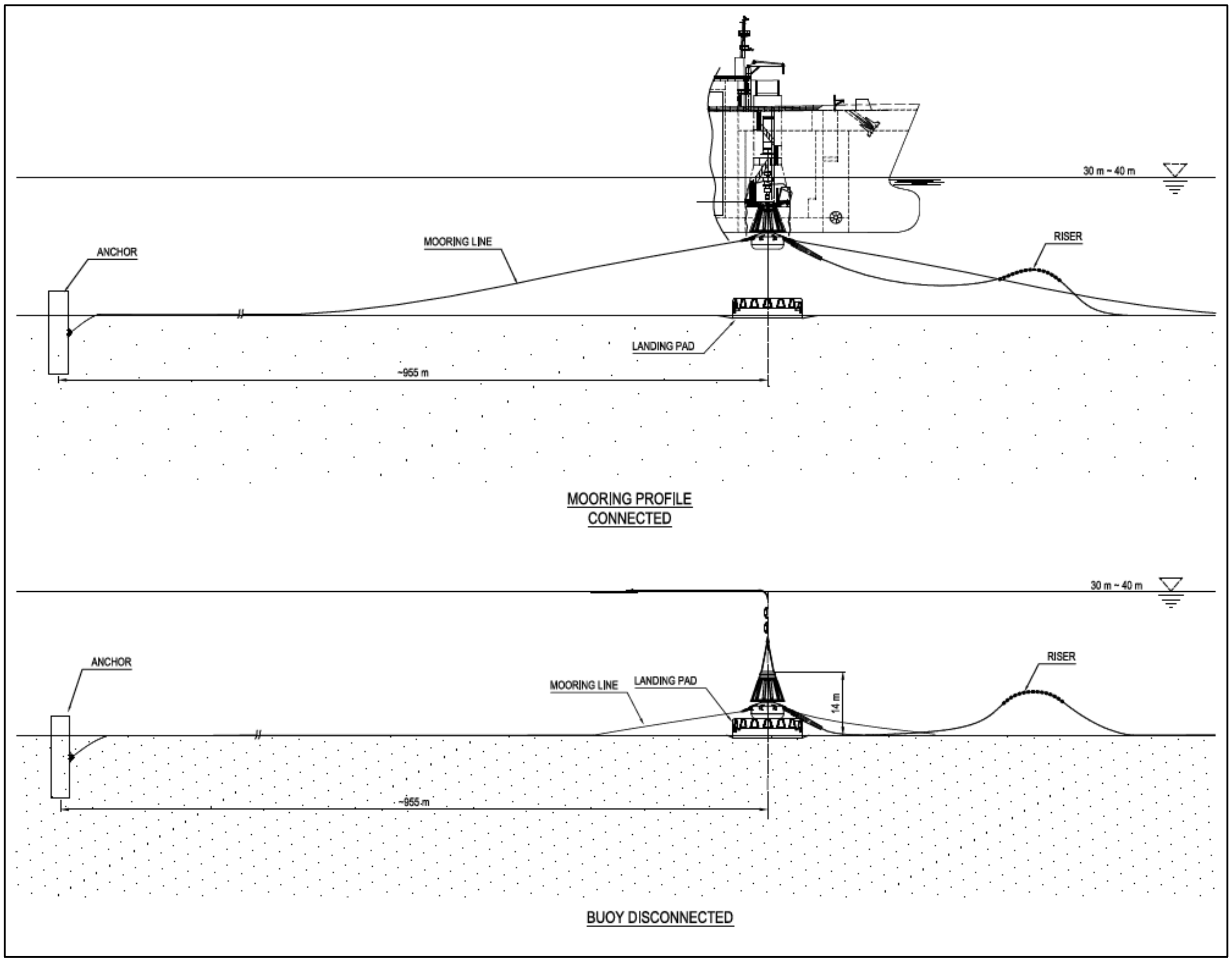

Figure 2.1-8. Flexible Riser System

2.1.8 PLEM

Each STL Buoy would have a PLEM anchored to the seafloor that would serve as the termination point of the STL Buoy system and interface between the flexible riser and the pipeline lateral (Figure 2.1-9). Each PLEM would permanently displace a 33-foot by 33-foot area of sea floor. The prefabricated PLEMs would be designed specifically for the physical conditions at the proposed Port facilities.

The PLEM would consist of several valves, and fittings would be mounted on a structure. The structure would be fixed to the seafloor using skirted mud mats or, if necessary, a suction anchor system. The PLEM would be designed to accommodate the dynamic loading applied by the flexible riser, currents and other conditions.

The PLEM would be the termination point for the flexible riser. The PLEM would include a manual isolation valve located downstream of the flexible riser termination flange for installation and maintenance. The PLEM would also include an ESD valve, check valve and manual isolation valve located upstream of the pipeline lateral. The ESD valve would be a fail-safe-close type valve that would be remotely controlled from the LNGRV through the umbilical. The check valve would prevent backflow from the pipeline lateral and the manual isolation valve would allow for isolation of the PLEM from the pipeline lateral during maintenance.

The PLEM would be designed to accommodate removable temporary pig launchers/receivers connected to the subsea valves. In addition, the PLEM piping that would attach to the flexible riser would also be installed with a pre-loaded dewatering pig.

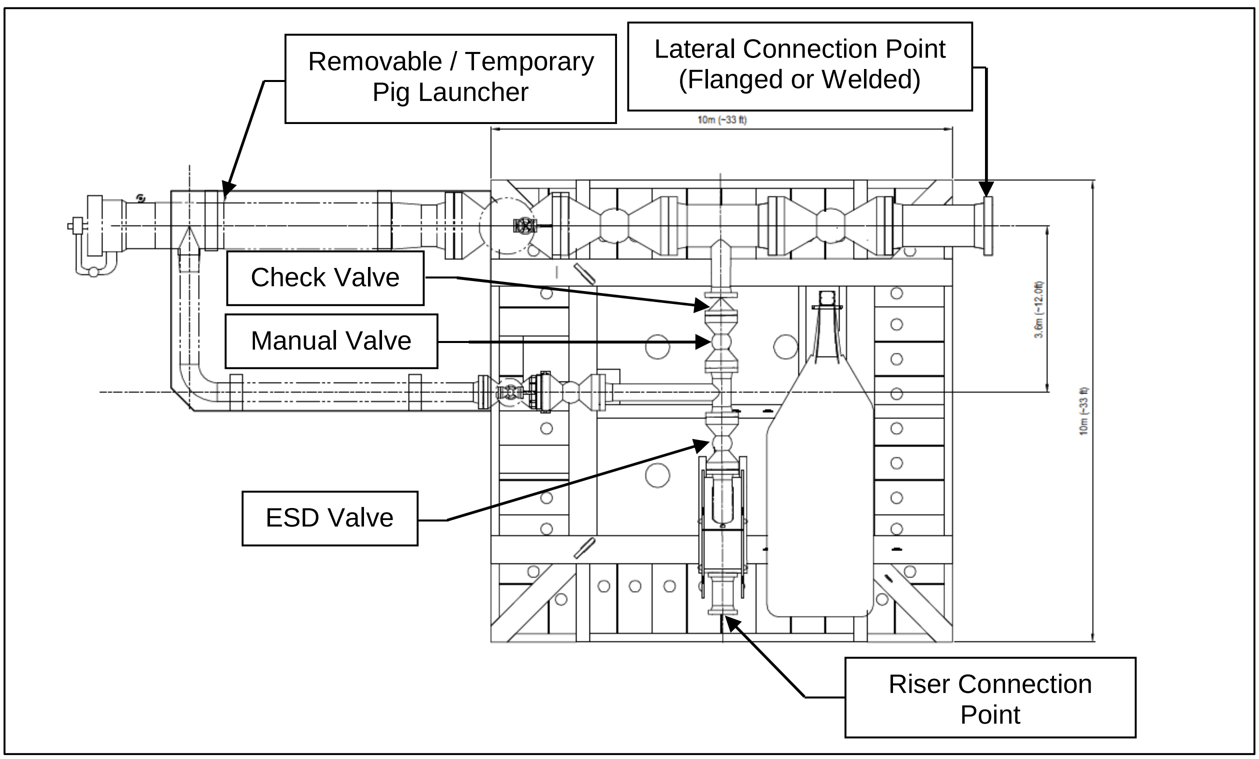

Figure 2.1-9. PLEM Configuration

2.1.9 Pipeline Laterals

The proposed Project would consist of two pipeline laterals, one for each STL Buoy (Figure 2.1-10). The pipeline lateral delivering natural gas from the southwestern STL Buoy (Lateral 1) would be approximately 0.76 nautical mile, while the pipeline lateral delivering gas from the northeastern STL Buoy (Lateral 2) would be approximately 1.54 nautical miles. The 26-inch-diameter pipeline laterals would connect each PLEM to the CYA. It is expected that installation of the pipeline laterals would temporarily displace approximately 48,900 cubic yards of seafloor material, over a 24 acre area.

2.1.10 CYA

The CYA would be installed at the connection between the proposed Mainline and the two pipeline laterals (Figure 2.1-10). The end of the proposed Mainline would be lifted to the surface, trimmed, and the CYA welded to the proposed Mainline. It is expected that installation of the CYA would displace approximately 2,800 cubic yards of seafloor material, over a 0.2 acre area.

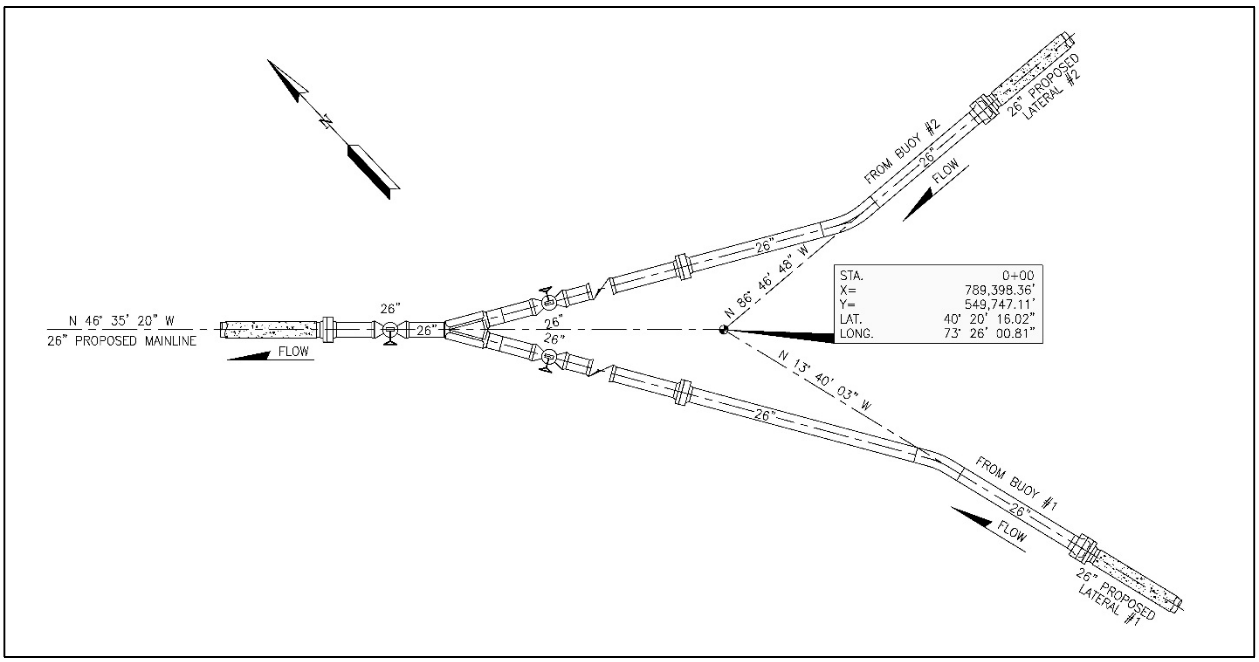

Figure 2.1-10. CYA with Associated Pipeline Laterals and Proposed Mainline Connections

2.1.11 Mainline

The proposed Mainline would be approximately 18.8 nautical miles in length from the CYA to the terminus at the connection with the Transco Lower New York Bay Lateral. For approximately 16.8 nautical miles, from MP 0.0 to MP 19.3, the proposed Mainline would be located in federal waters. The remaining 2.0 nautical miles, from MP 19.3 to MP 21.67, would be within New York state waters. The proposed Mainline would head in a northwest direction from its beginning point at the CYA to its terminus at the Transco Lower New York Bay Lateral. The proposed Mainline would be 26 inches in diameter and buried to a depth of 48 inches below the sediment for an initial length of 14.8 nautical miles, from MP 0.0 to MP 17.0, and for 1.4 nautical miles, from MP 20.1 to 21.67 (see Figure 2.1-3). For approximately 2.7 nautical miles through the Ambrose anchorage area, from MP 17.0 to MP 21.67, the USACE has determined that 7 feet of burial below the sediment is required. Mainline installation would be expected to displace approximately 145,700 cubic yards over 53 acres between MP 17.0 and MP 20.1

where 7 feet of burial is required. The remaining installation is expected to displace approximately 363,100 cubic yards over 166 acres (Table 2.1-3).

Table 2.1-3. Summary of Proposed Mainline Seabed Impacts

Starting MP[1]	Ending MP[1]	Pipeline Lowering Method	Length (nautical miles)	Volume Displaced (cubic yards)	Total Impact (acres)
0.00	16.97	post-lay plow	14.8	331,900	152
16.97	20.08	post-lay plow and jet	2.7	145,700	53
20.08	21.67	post-lay plow	1.4	31,200	14
		Total	**18.83**	**508,800**	**219**

[1] From MP 0.00 to MP 19.30, the proposed Mainline would be within federal waters. From MP 19.30 to MP 21.67, the proposed Mainline would be within New York state waters.

For utility crossings, the use of a mud pump and jetting techniques would be used. Utility crossings would be expected to displace approximately 15,600 cubic yards over 2.6 acres between MP 3.09 and MP 21.42 (Table 2.1-4). For the utility crossing for the Neptune Regional Transmission System Power Cable (Neptune Cable) burial, a 4-foot depth for the proposed Mainline may not be possible. In such cases, 24 inches of burial depth in compacted rock would be required[18] and would be achieved using 18 inches of concrete matting overlaying 6 inches of 1 inch minus sand bag at the crossing location for a radial distance of 3 feet around the center the utility crossing location. As the proposed Mainline rises from a 4-foot burial depth to the utility crossing, 6-inch thick concrete matting would be used. Total area of concrete matting would be approximately 0.1 acres. All concrete matting would be buried to a 3-foot depth along the outside edge to mitigate the hazard of anchor strikes or snags from ocean shipping or due to snagging of bottom fishing trawling gear.

Table 2.1-4. Summary of Proposed Mainline Utility Crossing Impacts

Utility	MP Location[1]	Pipeline Lowering Method	Length (nautical miles)	Volume Displaced (cubic yards)	Total Impact (acres)
Utility ID 3A	3.09	Mud pump and jet	n/a	2,300	0.4
Utility ID 3B	6.05	Mud pump and jet	n/a	2,300	0.4
Utility ID 2	9.94	Mud pump and jet	n/a	2,300	0.4
Utility ID 4	18.93	Mud pump and jet	n/a	4,100	0.6
Utility ID (Neptune)	21.13	Mud pump and jet	n/a	2,300	0.4
		Concrete Mats	500 feet	n/a	0.1
Utility ID 6	21.42	Mud pump and jet	n/a	2,300	0.4
		Total	**n/a**	**15,600**	**2.7**

[1] From MP 0.00 to MP 19.30, the proposed Mainline would be within federal waters. From MP 19.30 to MP 21.67, the proposed Mainline would be within New York state waters.

[18] Required by the Office of Pipeline Safety, Department of Transportation and published in 49 CFR 192.327 and 49 CFR 195.248.

2.1.12 SSTI Assembly

The SSTI assembly would consist of three spools plus a pig launcher/receiver as a temporary fixture during pigging operations (Figure 2.1-11). It is expected that installation of the SSTI assembly would displace approximately 3,700 cubic yards of seafloor material, over a 0.3-acre area. The three spools would consist of the following:

- Spool #1 – A 30-inch-diameter header that would connect the two hot-taps, check valves that isolate each hot-tap in the event of an upset condition, ring type joint flange to connect the SSTI to the hot-tap, a 30-inch by 26-inch Tee, and another ring type joint flange on the 26-inch side of the Tee. The 30-inch header would be braced to the Transco Lower New York Bay Lateral to protect the hot-tap and flange connections;
- Spool #2 – Fabricated with random lengths of pipe and a 90-degree segmentable bend that would be field trimmed after divers complete the metrology between the flange faces of Spool #1 and Spool #3; and
- Spool #3 – Fabricated using 26-inch pipe containing a 26-inch by 26-inch Tee, two ball valves, a ring type joint flange as the connection point of the temporary pig launcher/receiver, a 26-inch by 8-inch Tee for the pig launcher "kicker" line and another ring type joint flange as the connection to Spool #2.

2.1.13 Onshore Facilities

Several onshore facilities would be required for construction and operation of the proposed Project. Onshore facilities required would include:

- Pipe staging and concrete weight coating (CWC) facility;
- Shore-based office and warehouse space for construction;
- Shore-based office and warehouse space for operations; and
- Support vessel staging area.

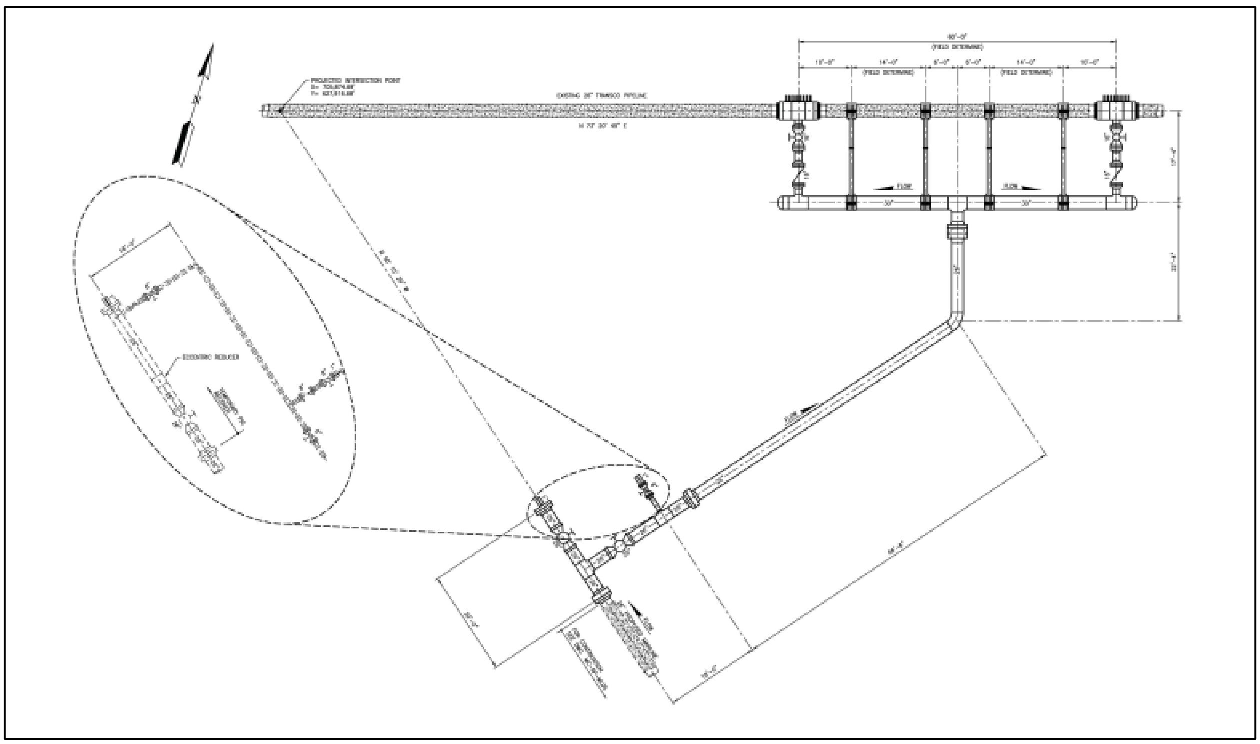

Figure 2.1-11. SSTI Assembly

A suitable location for a pipe staging and CWC facility would be selected during the development phase of the proposed Project. A site on Quonset Point, Rhode Island, and a site on Port of Coeymans, New York, have undergone initial review and are discussed in Section 2.2.1.5. The chosen site would require the undertaking of several preparatory steps prior to operating the facility. These would include:

- Foundation reinforcement to support the weight of the coating plant;
- Acquisition of raw materials (iron ore, sand, gravel, and cement) for the concrete and the potential use of a pier if materials are delivered via barge;
- Acquisition of suitable water supply;
- Installation, if necessary, of electrical service;
- Local air permit for the CWC batch plant;
- Obtaining Transportation Worker Identification Credential cards for on-site personnel;
- Hire or mobilize heavy lift equipment (flatbed trucks, front-end loaders, cranes, etc.) capable of lifting and transporting the pipe; and
- Set up temporary office facilities for the CWC and pipe staging project management team.

The proposed Project would also require office and warehouse space for construction, operations and decommissioning. Liberty has indicated that existing, similarly purposed facilities with the necessary existing infrastructure would be selected for this purpose. For the construction office and warehouse space, Liberty would plan to find a location within the Staten Island or Long Island area with waterfront dock space with sufficient depth and crane capacity to load Project equipment, dock space for multiple construction vessels, and within a close general proximity to the proposed Port facilities. As of the publication of this document, Liberty has not identified a location for the office and warehouse for operations.

A dedicated support vessel would be required to assist with various operations at the proposed Port facilities. Liberty has indicated that operations would require the support vessel for weekly inspections of surface components and approximately one trip per LNGRV arrival. This vessel would be an ocean class towing vessel of up to 130 feet in length, a bollard pull (Ahead/Astern) of approximately 75 metric tons, and a draft of roughly 23 feet, and would be powered by diesel engines with up to a total of 5,000 horsepower. It is anticipated that the vessel would be staffed by a crew of four to six. The dedicated support vessel would also be equipped with firefighting capability up to Det Norske Veritas (DNV) Firefighting (FiFi) Class 1 requirements. Liberty has indicated that the support vessel would be staged at an existing onshore facility with the necessary infrastructure requirements. As of the publication of this document, Liberty has not identified a location for the support vessel staging area.

2.1.14 Sea State Limitations and Weather Monitoring

Port Ambrose's Operations Manual would specify operational sea-state limitations and weather monitoring protocols that would be implemented during operation of the proposed Project. The LNGRV Master and Person-in-Charge would monitor weather conditions and forecasts at all times that an LNGRV is moored to a STL Buoy. Operational limits would be set by several weather-driven factors.

There would be several sea-state limitations during connection of the LNGRV to the STL Buoy. The maximum sea-state conditions for connection of a LNGRV to a STL Buoy would be:

- Significant wave height – 9.8 feet;
- Wind speed – 30 knots; and
- Current speed – 2.9 knots.

The worst conditions by which the LNGRV could remain moored to a STL Buoy are set by the design limitations of the STL Buoy and mooring system. These would also represent the parameters by which the LNGRVs could discharge natural gas. The parameters are based on the 10-year storm condition for wind and wave height and the 100-year current condition. These parameters are:

- Significant wave height – 22 feet;
- Wind speed – 52 knots; and
- Current speed – 1.7 knots.

The maximum sea-state for disconnection of the LNGRV from the STL Buoy would be the 10-year storm condition.

2.1.15 Maritime, Safety, and Related Matters

Limited access areas including Safety Zones, No Anchoring Areas (NAAs), and Areas to be Avoided (ATBA) are established with varying degrees of vessel restrictions and notification requirements.

Pursuant to the regulations of the Deepwater Port Act of 1974 (DWPA), the U.S. Coast Guard (USCG) is authorized to establish temporary and mandatory Safety Zones around deepwater ports whether or not a vessel is present. As proposed by Liberty, the Safety Zone radius would be 1,640 feet (500 meters) from the center of each STL Buoy, when no LNGRV is present, encompassing a total combined area for Safety Zones for both STL Buoys of approximately 388 acres or 0.6 square mile (Figure 2.1-12). When an LNG carrier is present, the Safety Zone would extend 1,640 feet (500 meters) off the stern of the 919-foot (280-meter) vessel as it weathervanes on the STL Buoy effectively creating an approximately 2,560-foot (780-meter) radius Safety Zone from the STL Buoy.

In addition to the Safety Zone, a NAA and an ATBA would be established at the request of the USCG to the IMO. As proposed by Liberty, the NAA and ATBA would be the same size with a radius of 3,281 feet (1,000 meters) from the center of each STL Buoy. This would be approximately 1,552 acres or 2.4 square miles around each STL Buoy (Figure 2.1-12).

LNG vessel traffic would be coordinated by Liberty personnel (Figure 2.1-13). The actual size of the ATBA that would be requested of the IMO would be determined through the advice and consent of the USCG. Past practices has been that ATBAs have a radius of at least 820 feet (250 meters) longer than that of the NAA for appropriate stand-off, which would occupy an area of 1, 213 acres around each STL Buoy. The ATBA would appear on subsequent editions of the local and regional nautical charts for both STL Buoys. The ATBA is meant to discourage vessel traffic and is recommendatory.

2.1.16 Construction

Construction of the proposed Project would be anticipated to take approximately 20 months. Off-site fabrication and pre-construction activities would commence in late 2016 and take approximately 9 to 12 months. Installation of the offshore components would begin in early 2017 and would take approximately nine months to complete. Construction of the proposed Project would be completed in late fourth quarter 2017.

The following sections present a detailed description of the construction phases of the proposed Project.

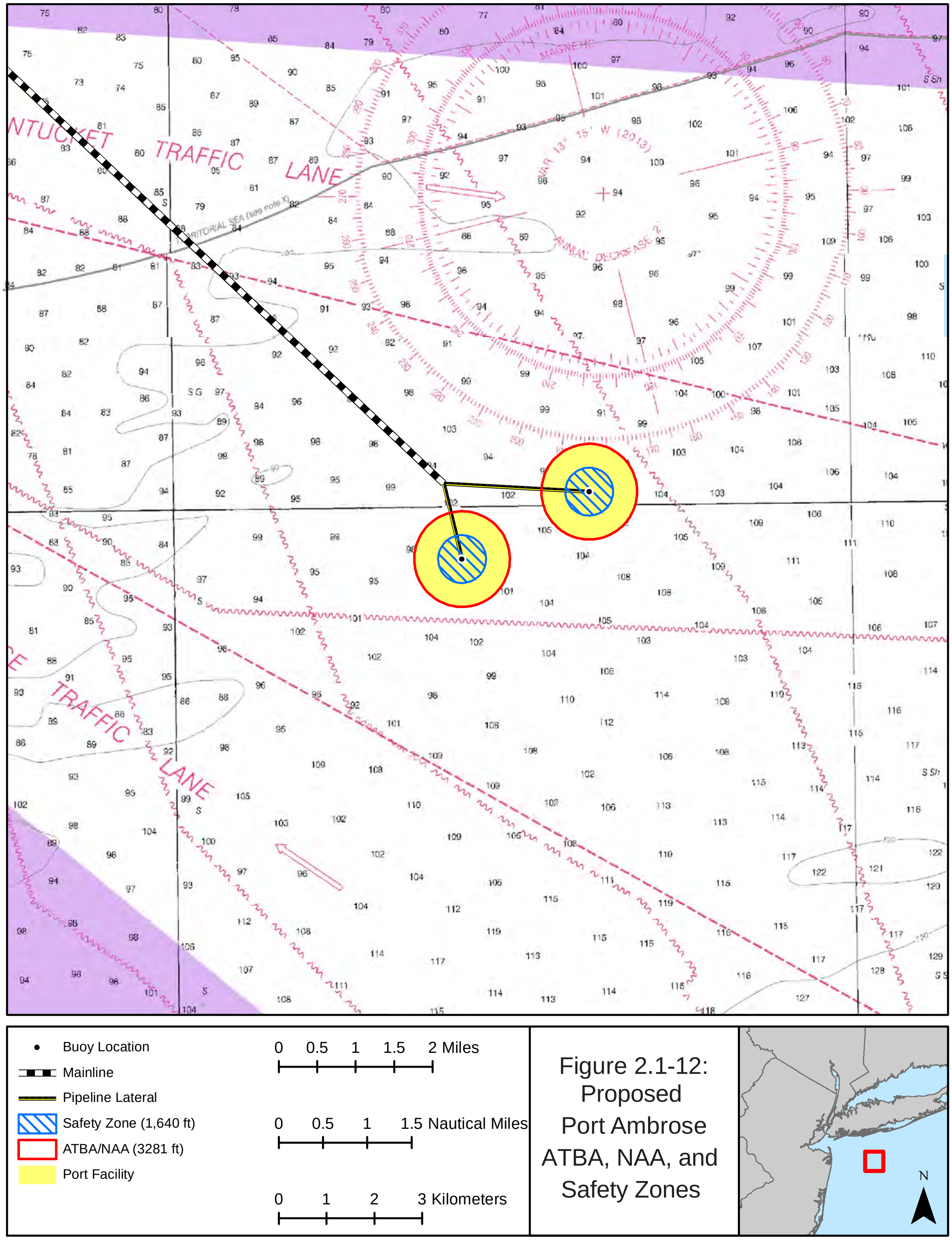

Figure 2.1-12. Proposed Port Ambrose ATBA, NAA, and Safety Zones

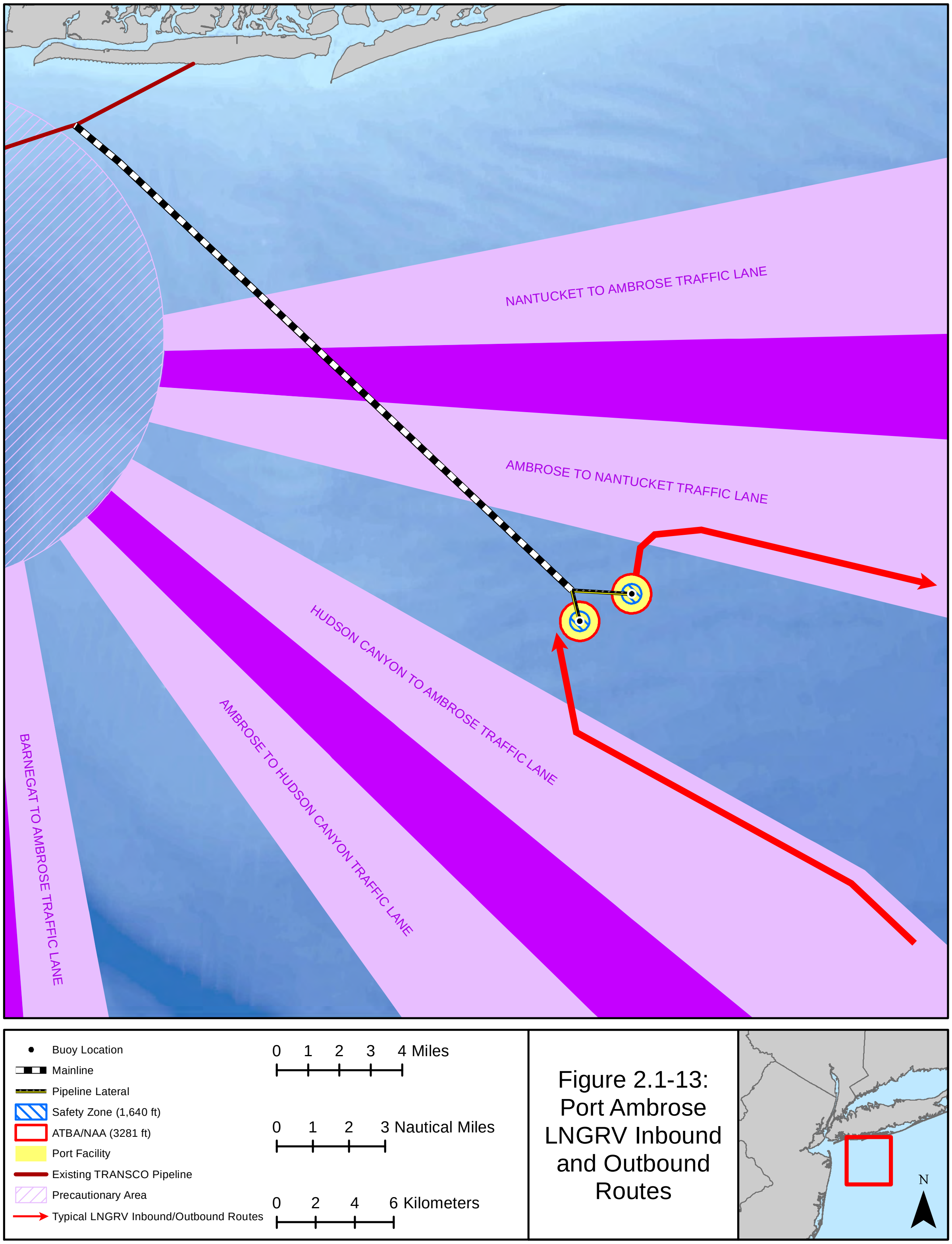

Figure 2.1-13. **Proposed Port Ambrose LNGRV Inbound and Outbound Routes**

2.1.16.1 STL Buoys, Flexible Riser and Umbilical

The first step for installing the STL Buoys would be the installation of the anchor piles. The installation of a suction anchor into the seabed includes the following main stages:

1. Position suction anchor on seabed. This stage serves to place the anchor at the correct plan location and orientation of the pad-eye and anchor chain.
2. Penetration of anchor by self-weight. During this stage the anchor will penetrate without underpressure applied. The valves are kept open to allow passage of water through the suction pump nozzle.
3. Activation of pump – Initiation of underpressure. A pump skid is placed at the suction pump nozzle utilizing ROVs or a self-contained system that is operated from the surface via an umbilical is activated. The verticality of the anchor axis is monitored at this stage and adjusted, as required, by the surface vessels.
4. Penetration by underpressure to target depth. With underpressure applied inside the anchor compartment the anchor will penetrate into the seabed by a combination of anchor self-weight and vertical downward thrust from the differential pressure generated by the underpressure inside the anchor compartment.
5. Removal of pump and close nozzle. At the target penetration depth of the anchor, pressure inside the anchor compartment is equalized to ambient hydrostatic pressure, the pump is removed, and the outlet where the pump was placed is closed off using a blind flange, or similar fitting.

Monitoring during installation of the suction anchor is accomplished by utilization of ROVs and monitoring instruments. These steps would be repeated for the remaining driven piles.

The next component that would be installed would be the landing pad. The heavy lift vessel would be positioned at the STL Buoy target location to install the landing pad. The landing pad would be fitted with transponders to ensure proper placement and orientation. The gravity-based landing pad would then be lowered to the seafloor and the skirted mud mat would penetrate the seabed to the appropriate depth.

Next, the STL Buoy onboard the heavy lift vessel would be positioned above the landing pad. The STL Buoy would have the eight pre-installed upper chain segments attached to the mooring connection points on the turret. Using the heavy lift vessel crane, the STL Buoy would be lowered into the water allowing its ballast compartments to flood as it is lowered onto the landing pad.

The holdback tether line and tether anchor would be the next components to be installed, and would be used to hold the flexible riser and umbilical in position. The tether anchor would be connected to the chain segment and polyester rope and lowered to the seafloor. The holdback line would then flake out to the seafloor and a second clump weight anchor would be temporarily placed on the end of the holdback in anticipation of the future connection to the flexible riser and umbilical. Prior to installing the flexible riser and umbilical, the wire segments would be connected to the chain segments. The flexible riser and umbilical would be brought to the work site on separate reels and lowered to the seafloor from the DP dive support vessel. The flexible riser and umbilical would be held in-place through the use of temporary clump weights. Divers would then connect the flexible riser and umbilical to the holdback tether lines and then to make the connections of the flexible riser and umbilical to the STL Buoy and to the PLEM. Divers would then complete the mooring line connections to the STL Buoy.

2.1.16.2 PLEM and Pipeline Laterals

The PLEM would be directly welded to the end of the pipeline lateral prior to lowering to the seafloor. The PLEM would be secured in-place using a gravity-based skirted mud mat or suction anchor. Final site-specific geotechnical surveys are needed prior to final PLEM design. Geotechnical surveys include:

- Bore sample at each anchor location down to 131 feet;
- Cone Penetration Test at each suction anchor location down to 131 feet, as continuously as possible and not at more than 4.9 foot intervals; and
- A piston core or shallow bore (16.4 foot depth) sample at the PLEM base location to confirm the soil condition.

The proposed pipeline laterals would be installed using the same methodologies described for the proposed Mainline in Section 2.1.16.4. The pipeline laterals would be installed using a DP pipelay vessel (DPPV) employing the S-Lay method. Plowing or jetting techniques would be used to lower the pipe and the trench would be backfilled with sidecast material by reversing the plow. The pipeline laterals would be buried to a depth of 4 feet to the top of the pipe.

2.1.16.3 CYA

The CYA would be installed at MP 0.0 at the southern end of the proposed Mainline. The lay-down head, welded to the end of the Mainline, would be lifted from the seafloor and removed. The end of the Mainline would then be trimmed and the CYA welded to the Mainline. Following the non-destructive weld examination, one branch of the CYA would be sealed by bolting a steel blind to the CYA flange. The Mainline and pipeline lateral tie-ins would then be flooded and lowered using a DP dive support vessel as the work platform. After flooding, divers would take measurements about the flange face to determine the size required for the spools connecting the pipeline lateral to the CYA. The previously connected spool, fabricated with extra pipe, would be trimmed to match the measurements obtained by the divers. The spool would then be installed by divers using tensioning equipment.

2.1.16.4 Mainline

The proposed Mainline would be installed using DPPV employing the S-Lay method. The burial depth of 4 feet to the top of pipe would be achieved through the use of plowing or jetting techniques from MP 0.0 to MP 21.67 (18.8 nautical miles). The area between MP 17.0 and MP 20.1 (2.7 nautical miles) through the Ambrose anchorage area would require a burial depth of 7 feet to the top of pipe and would be achieved utilizing a pipeline jet sled after this segment of the proposed Mainline has been plowed. A jet sled pipeline lowering operation is generally described as fluidizing the soil beneath the proposed Mainline with high-pressure water delivered through jetting nozzles and removing the fluidized soil through air lifts or eductors, thereby allowing the proposed Mainline to settle into the trench.

Forty-foot joints of pipe would be welded together into a continuous pipeline (Figure 2.1-14). As each new joint is welded, the DPPV would advance 40 feet and the process would continue in an assembly-line-like fashion. All welds would go through a non-destructing examination prior to being coated with a corrosion protective application and lowered to the seafloor. The S-shaped profile of the pipe would be supported by an articulated stinger and held in tension by one or more tension machines located on the DPPV.

Once the pipe has been laid in the desired position on the seafloor, a DP vessel would begin plowing operations. A plow would be positioned on the top of and surrounding the pipe, which would be pulled by the DP vessel. As the vessel and the plow advance, the plow would lift the pipe and capture it within rollers while simultaneously excavating a trench. The pipe would then settle into the trench behind the plow. From MP 17.0 to 21.1, a pipeline jet sled would be used to achieve burial to the required 7 feet to the top of pipe through the Ambrose anchorage area after this segment of the proposed Mainline has been plowed. In some cases, the plowing technique may not reach the desired depth or a utility crossing may be encountered where use of the plowing technique is not appropriate. In these cases, the hand-jetting technique would be employed. Hand-jetting would also be used for the PLEM areas, CYA area, and SSTI assembly area. A DP dive support vessel would be used to perform the jetting operation at these locations with the exception of the SSTI assembly area where a moored barge would be used. The hand-jetting equipment used would range from air-lift and water-jetting systems to excavate the smaller volume locations. Submersible pumps would be used for lowering longer sections of pipe or where larger volumes of trenching are required. Both forms of jetting would be controlled and monitored by divers.

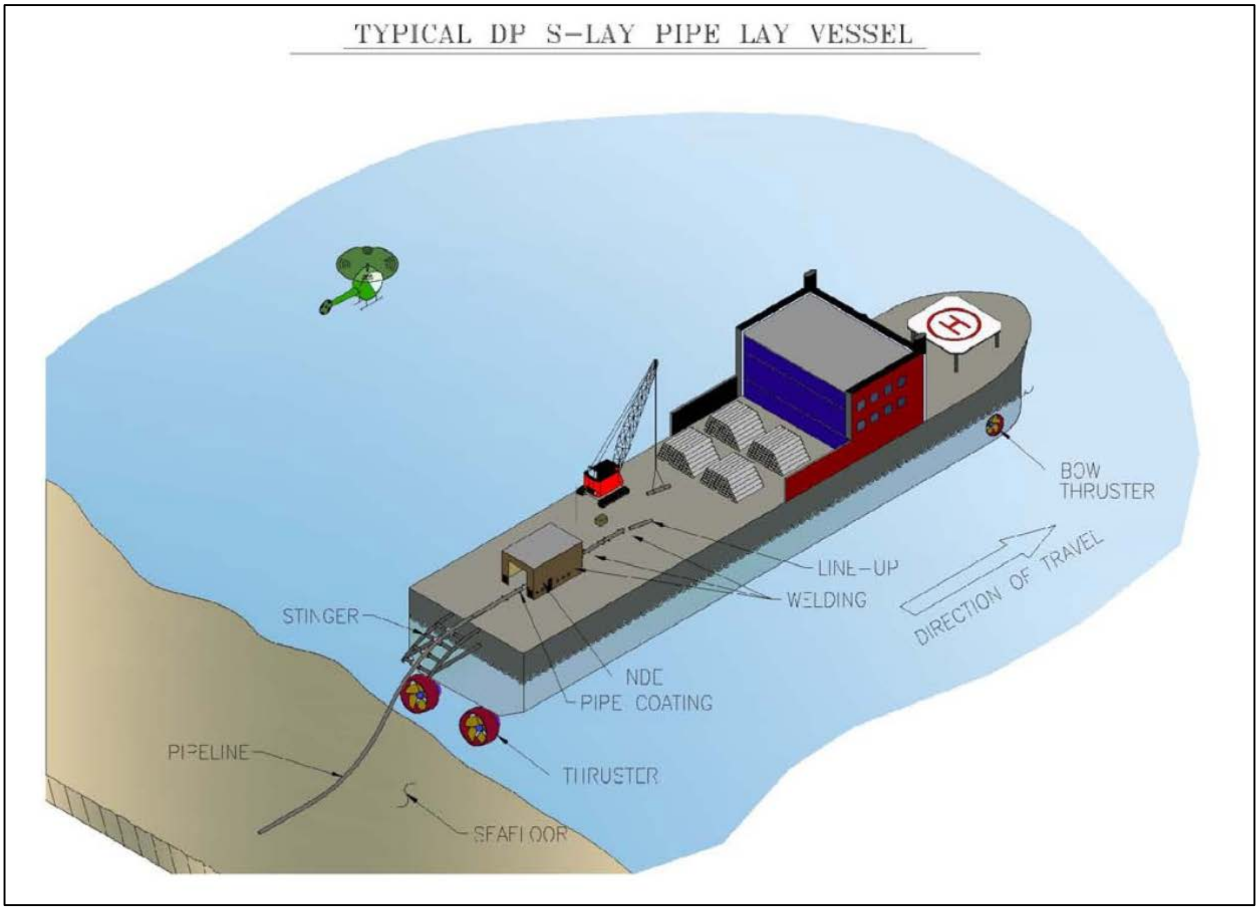

Figure 2.1-14. Pipeline Construction

As many as six potential submarine cables have been identified along the proposed Mainline route. With the exception of one, all cables are believed to be out-of-service. These cables would be located and cut, or where necessary, lowered subsea by divers using hand-jetting equipment. These cable crossings could also be performed by installing a concrete mat parallel to and offsetting the existing cable to support the proposed Mainline as it crosses the cable. The bottom of the concrete mats would be installed to ensure a minimum separation of 18 inches between the pipe and existing cable. The concrete mats would not be placed in direct contact with the existing cable. The known cable is the Neptune electrical cable and it is located at MP 21.1 (see Section 2.1.11).

2.1.16.5 SSTI Assembly

Two hot-taps at the Transco Lower New York Bay Lateral would be installed as a separate operation. The hot-taps would be installed where the top of the pipeline is deeper than 4 feet below the natural seabed. The hot-tap assemblies and components would include a ball valve and ring-type joint flange. The ring type joint flange would be the connecting point of the SSTI that would form the connection between the proposed Mainline and the Transco Lower New York Bay Lateral.

The connection point of the SSTI and hot-tap would be excavated by submersible pumps and diver air-lift to keep the spool components below the normal seabed wherever possible. The size and weight of

Spool #1 would determine whether the piping and components would be skid-mounted and require installation by the pipelay vessel after the pipelay and lowering operations are completed.

The protection of the valves and the hot-tap connection would be required during construction and/or as a permanent installation during operations. To achieve this, mats, sandbags, and/or prefabricated protective structures could be used. All components that require possible access during operation or that protrude above the seafloor would be installed with a protective structure. The seafloor adjacent to the hot-tap would be excavated using a submersible mud pump to facilitate the lowering of the protective cage and the pipeline spool/pipeline to 4 feet below the natural bottom.

2.1.17 Pipeline Commissioning and Hydrostatic Testing

Flooding the proposed Mainline and pipeline laterals would be required prior to the subsea tie-in of adjoining pipeline segments, as well as for the backfill plowing operation and for hydrostatic testing. A pipeline flooding vessel would be equipped with sufficient pumps and large diameter hoses to maintain the required flowrate in a marine environment, as well as equipment to store, transfer and inject biocide. Water would be withdrawn from a suitable depth and filtered to remove sediments. An intake screen at the pump suction would be sized to minimize entrainment and impingement of aquatic life by limiting intake velocities to less than 0.5 feet per second (ft/sec).

Seawater would be pumped into the pipe pushing a train of pigs to clean, remove air pockets, and inspect the pipe as they move down the line. The velocity of the pig train during flooding and dewatering would be controlled by the pumping rate and by back pressure to maintain a velocity of approximately 1 ft/sec. This would result in an estimated fill and discharge rate of 1,500 gpm for the 26-inch-diameter pipeline.

Seawater that would reside in the proposed Mainline for more than 30 days would be treated with a tetrakis (hydroxymethyl) phosphonium sulfate (THPS)-based biocide to reduce the potential for microbiologically influenced corrosion. The treated seawater would remain in the proposed Mainline to be subsequently used during hydrostatic testing. Additional water required to pressurize the system for testing would also be treated with a THPS-based biocide.

Once the proposed Mainline and pipeline laterals have been flooded with seawater and the tie-ins and backfilling operations have been completed, the pipeline segments would be hydrostatically tested. Hydrostatic tests would be performed in accordance with the U.S. Department of Transportation (DOT) requirements at 49 CFR 192. The pipeline segments would be tested to 1.25 times the design pressure of 1,480 pounds per square inch gauge (psig) for a minimum of eight hours. The maximum allowable operating pressure of the pipeline would be 960 psig. Initially, the proposed Mainline and pipeline laterals would be pressurized to approximately 200 to 300 psig with low-pressure, high-volume pumps. Once reached, these pumps would be disconnected and replaced with a high-pressure, low-volume pump to continue the pressurization process. The test pressure would be achieved through a series of pressurizations and maintained for an eight-hour hold period within specified minimum and maximum test pressures.

After acceptance of the hydrostatic test, dewatering of the pipeline segments would commence. Water would be vented from the system as pipeline internal pressure is released, followed by the complete dewatering of the proposed Mainline. High-pressure hoses would be connected to the pipeline segment to enable pressure bleed-off into a dewatering vessel. Seawater treated with the THPS-based biocide would be captured and treated with hydrogen peroxide. The amount of hydrogen peroxide required would be determined through a sampling and analysis program. The treated seawater would pass through a series of holding or ballast tanks allowing time for the THPS-based biocide to be neutralized prior to being discharged through a subsurface diffuser. Water remaining in the proposed Mainline and pipeline laterals after pressure has returned to ambient would be displaced through the use of trains of pigs. The valve and leg associated with one of the pipeline laterals at the CYA would be closed and air compressors would be installed at the SSTI. The air pressure would push the pig from the SSTI past the CYA before being captured in the pig receiver at the PLEM. This process would then be repeated for the second pipeline lateral and PLEM.

Once the pigs used for dewatering have been recovered, the proposed Mainline and pipeline laterals would be dried to a specified dew point of -40°F with superheated air provided by dehumidifying equipment. Purging of the air with a blanket of dry nitrogen would ensure that the system is inert. A soak test, or stabilization period of 24 hours, would be performed to demonstrate that no free water is left in the proposed Mainline and pipeline laterals. Prior to packing the system with natural gas, a drying agent (glycol or methanol) would be injected at each end of the tie-ins to the laterals to ensure residual water inadvertently trapped or undetected would not create the formation of hydrates when the system is pressurized with natural gas.

2.1.18 Decommissioning

At the end of its useful life (25 years), the proposed Project would be decommissioned. All of the proposed Port facilities would be recovered and disposed of in a central storage location onshore. The STL Buoys, PLEMs, flexible risers, control umbilicals, mooring chains, and wire rope would be recovered and demobilized using similar techniques and equipment utilized for construction. The suction anchors used to secure the mooring lines would be inspected and backed out by pumping seawater into the pile and recovering it for onshore recycling/disposal. Alternatively, the pile could be cut below the mud line should conditions warrant. The cut-off sections of the piles would be recovered and transported by barge to the shore for disposal. The remaining portions of the piles would be abandoned in-place below the mud line.

In addition to the proposed Port facilities, the pipeline facilities would also need to be decommissioned. However, the pipeline facilities comprising of the pipeline laterals and proposed Mainline would be abandoned in-place in accordance with 30 CFR 250, Subpart J and Q and 49 CFR 192. The hot-tap connection to the Transco Lower New York Bay Lateral would be sealed or capped to allow continued operation of the Transco Lower New York Bay Lateral. The proposed Mainline would be disconnected, depressurized, purged, filled with seawater, cut, and plugged. The ends would be buried in-place. The lateral pipelines would be disconnected from the PLEMs and the ends sealed or capped. In accordance with 49 CFR 192.727(g)(1), data on the abandoned pipeline facilities would be submitted to the DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) National Pipeline Mapping System.

2.2 Alternatives

The National Environmental Policy Act (NEPA) of 1969, requires that any federal agency proposing a major action consider reasonable alternatives to the proposed action. Evaluation of alternatives assists in avoiding unnecessary impacts by analyzing reasonable options to achieve the underlying purpose that Liberty may or may not have considered. This analysis of alternatives broadens the scope of options that might be available to reduce or avoid impacts associated with the action as proposed by Liberty. The NEPA environmental analysis is one of the nine factors the Secretary must consider in making a final determination (33 U.S.C. 1503c). Alternatives for a LNG deepwater port may extend to matters such as its specific design, location, methods of construction, and technologies for storing and re-gasifying LNG.

To warrant detailed evaluation by the USCG and the Maritime Administration (MARAD), an alternative must be reasonable and meet the purpose and need of the proposed Project. Alternatives concerning location, construction, and operation of a deepwater port for receipt and transfer of LNG must also meet essential technical, engineering, and economic threshold requirements to ensure that a proposed action is compliant with governing standards. Screening criteria are used to determine the feasibility of alternatives. The Secretary has identified that potential alternatives to deepwater ports, such as the proposed Project, may include alternative deepwater port designs, locations, technologies and operations, as well as the No Action Alternative.

Our evaluation of alternatives is presented in the following sections:

- Deepwater Port Alternatives (Section 2.2.1)
  - Offshore vs Onshore LNG Alternatives (Section 2.2.1.1)
  - Deepwater Port Designs Alternatives (Section 2.2.1.2)
  - Deepwater Port Location Alternatives (Section 2.2.1.3)
  - Anchor Alternatives (2.2.1.4)
  - Mainline Alternatives (2.2.1.5)
  - Onshore Pipe Staging and CWC Facility Alternatives (2.2.1.6)
  - LNG Vaporization Technology Alternatives (Section 2.2.1.7)
- No Action Alternative (Section 2.2.2)
- Energy Alternatives (Section 2.2.3)
  - Alternative Energy Sources (Section 2.2.3.1)
  - Energy Conservation Alternatives (Section 2.2.3.2)
  - Alternative Gas Supply Systems (Section 2.2.3.3)

The alternatives found to be reasonable are evaluated in this draft EIS and are based on the detailed discussion provided throughout Section 2.2.

2.2.1 Deepwater Port Alternatives

Alternative LNG deepwater port designs, locations, technologies, and operations were evaluated to determine whether they would be reasonable and environmentally preferable to the proposed action. This analysis was based on the assumption that, irrespective of design type or technologies employed, the LNG terminal would need to be within or near the targeted region if it is to meet the purpose and need of the proposed Project without requiring substantial upgrades to the existing infrastructure, which would likely result in equivalent or greater environmental impacts than those associated with construction and operation of the proposed Project.

2.2.1.1 Offshore vs Onshore LNG Alternatives

Congress has passed statutes that distribute responsibility for the development of LNG facilities in the United States across different agencies within the federal government. For offshore LNG facilities in federal waters, the USCG and MARAD jointly share responsibility for evaluating and processing applications submitted under the DWPA. For onshore facilities or those in state waters, the Federal Energy Regulatory Commission (FERC) is responsible under the Natural Gas Act. Proposed onshore and offshore LNG facilities are considered independent of one another (not mutually exclusive); for that reason, they are not considered to represent true alternatives to each other. Although onshore LNG facilities and LNG facilities expansions for import have been considered in the northeast United States, they would not provide natural gas to the downstate New York and Long Island market, which is the stated purpose and need of the proposed Project. These proposed onshore facilities are discussed further under the No Action Alternative (Section 2.2.2), because they could be developed regardless of the outcome of any proposed DWPA application. Additionally, this draft EIS does not address how many LNG facilities would be needed to meet the growing demand for natural gas in the downstate New York and Long Island market. It is likely that market forces, which include consideration for environmental impacts and associated permitting time and mitigation costs, would ensure that the LNG facility projects that ultimately would be developed offer the optimal combination of environmental and financial benefits while being consistent with sustainable development in the regions for which they are proposed.

2.2.1.2 Deepwater Port Design Alternatives

Selection of the optimal deepwater port design depends on the consideration of multiple environmental, technical, and commercial factors. Four specific environmental and technical considerations were evaluated in this analysis including:

- Air emissions;
- General environmental effects;
- Visual impacts; and
- Water depth and seafloor topography.

Six different deepwater port designs were considered in the alternatives analysis for the proposed Project. All of the design concepts would require the construction of a pipeline to deliver the natural gas to the target market. The designs considered included: (1) gravity-based structure (GBS); (2) platform-based unit; (3) HiLoad port design; (4) floating storage and regasification unit (FSRU); (5) STL Buoy; and (6) artificial island.

Each of the concept designs was evaluated as an alternative to the proposed Project to determine whether it would be reasonable and environmentally preferable. Although each of these concepts has some adaptability of design, each also has some inherent features that are most compatible with certain environmental conditions and that lend themselves to specific business models. Each of the alternative concept designs was evaluated based on its suitability for use in offshore New York, as well as its economic and operational feasibility.

Table 2.2-1 provides an environmental evaluation summary for each of the proposed deepwater port design alternatives based on the specific environmental and technical considerations evaluated in the analysis of the deepwater port design alternatives.

Gravity-Based Structure

The GBS would be composed of two pre-stressed reinforced concrete caissons that would be constructed at a graving dock, which is a specialized inshore construction facility with adjacent channel depths sufficient to float the completed structure. Graving dock land requirements and environmental impacts would vary from site to site, but could typically range between 50 to 100 acres.

The concrete structure would be floated to the site and installed to the seabed. All facilities associated with a typical LNG terminal (storage tanks, offloading, and vaporization facilities) would be attached to the concrete structure. Because the GBS must extend above the water surface but still enable access by LNG carriers, these designs are typically constrained to relatively shallow waters. In addition to the siting requirements and operational and environmental tradeoffs, economic feasibility must be considered. Due to the significant capital costs of GBS construction and installation, it appears these facilities are only economically feasible for projects with relatively large LNG storage capacity (200,000 to 300,000 cubic meters) and natural gas sendout volumes of 0.8 to 2.0 billion standard cubic feet per day. In the past, five LNG deepwater port applicants proposed these structures with two being approved by MARAD, but none were built.

Platform-Based Unit

A platform-based unit would consist of constructing or re-purposing an offshore unit, which is either an active or decommissioned OCS facility. The offshore unit would be attached to the seabed by multiple legs or a jacket structure with a working platform above the water. LNG unloading arms’ associated equipment, high-pressure LNG pumps and vaporizer, a pipe trestle, and breasting/mooring dolphins would be installed on the platform.

The LNG would be unloaded from the LNG carriers, vaporized on the platform, and delivered to the target market via a subsea pipeline. Depending on the size and location of the platform, cryogenic storage tanks may or may not be installed. These types of structures have been installed in water depths up to 1,400 feet and design specifications indicate that they could be installed in water depths up to 3,000 feet. Two past LNG deepwater port applicants proposed this type of port design, but only one was MARAD-approved and built. It was never commercially operated.

HiLoad Port Design

The HiLoad port design utilizes an open-loop vaporization system that operates below the water line of a floating platform. Because the HiLoad port design is a floating unit, its impact on the seafloor is minimal, consisting only of a conventional anchoring system. Additionally, the HiLoad anchoring system would not require specific seafloor characteristics and qualities. However, HiLoad port design tests under varying sea states have shown that depths greater than 350 feet are optimal. One past LNG deepwater port applicant proposed this type of port design. It was approved by MARAD but was never built. Recently, Teekay Corporation's *Navion Anglia* commenced sea passage to Las Palmas with their HiLoad Dynamic Positioning No. 1 docked on its port side. This is currently the only commercially used HiLoad unit to date, all other HiLoad uses have been at the testing level.

Floating Storage and Regasification Unit

A FSRU is a vessel-like barge capable of berthing and offloading LNG carriers, storing LNG in onboard cargo tanks, re-gasifying LNG, and then sending out the vaporized LNG through subsea pipelines. FSRUs are typically not self-propelled and are moored using anchor chains connected to an external turret. However, the FSRU proposed for the Calypso DWP off the Florida coast proposed a self-propelled FSRU that would be moved offshore during extreme weather.

The FSRU is based on conventional LNG carrier design and components of floating production, storage, and offloading systems, which are widely used in the offshore oil and gas production industry. Two LNG terminals have been proposed using the FSRU design, Cabrillo Port and Broadwater LNG in Long Island Sound (FERC), none of which were built. There is currently a proposed LNG import terminal using the FSRU design off the southern coast of Puerto Rico; and because this project is in state waters, it is under the FERC's jurisdiction.

STL Buoy System

This alternative would require the LNG carriers to be fitted with vaporization equipment and a connection point for an unloading buoy. This alternative does not require the construction of a fixed platform, jetty, GBS, or vaporization port. The LNG carrier would be moored to the STL Buoy. The LNG carrier would vaporize the gas onboard and discharge the natural gas through a flexible riser. The natural gas would then be transferred to a subsea pipeline for delivery to the target market. Four STL Buoy system LNG import terminals have been proposed with three being approved by MARAD. Three were built with two of these commercially operated.

Artificial Island

An artificial island would essentially be a man-made LNG facility, only constructed offshore. The selected site would be filled to create a man-made island with protective docking, unloading facilities, and the option for storage. An artificial island, similar to the previously proposed Safe Harbor Island Energy Terminal (a deepwater port), would require a seafloor footprint of approximately 116 acres. The LNG would be vaporized on the island and sent to the target market via a subsea pipeline. The artificial island design would include:

- A rock breakwater structure surrounding the main body of the island to provide a protected harbor for the berthing of LNG tankers and support vessels;
- Granular fill material (sand and gravel) for the main body of the island which would be contained and protected on all sides by a rock breakwater structure;
- A steel pile supported structure with the unloading facilities and associated mooring dolphins and breasting dolphins that would be capable of securing LNG tankers for the unloading of LNG cargo;
- LNG storage tanks constructed on steel pile supports to contain the LNG;
- LNG vaporization equipment;

- Facilities required for the docking of the LNG vessels and support of the LNG processing operation, including power generation and accommodations for workers; and
- Miscellaneous supporting facilities, such as sewage treatment system, a stormwater collection system, and administration, maintenance, and storage buildings.

One past LNG deepwater port applicant proposed this type of port design but the application was later withdrawn.

Deepwater Port Design Alternatives Evaluation

Air Emissions

Air emissions would vary for each alternative. The STL Buoy alternative would not require vaporization or processing at an additional facility (either on a platform, FSRU, or artificial island), which is likely to reduce emissions. All facility types would require some form of support vessels. However, because the STL Buoy and HiLoad port design alternatives would have the majority of necessary workers onboard the LNG carrier, the number of worker transits would be reduced compared to the other alternatives. All other alternatives would require additional workers to vaporize and process the LNG.

General Environmental Effects

General environmental effects can include impacts from water use and discharges, turbidity and sedimentation, as well as seafloor and fisheries impacts. Water usage would be dependent on the type of specific systems that would be selected for each alternative, as well as the number and type of support vessels required for operations. Installing large structures on the seafloor, such as for a GBS or artificial island, would have direct impacts on the seafloor as well as fisheries resources. These impacts can range from 10 to 100 acres. Also, the loss of this area would have impacts on recreational and commercial fisheries. On the other hand, artificial islands, GBS, and platform-based units can create new habitat through the development of hard substrate at different depths and artificial reefs.

Visual Impacts

With the exception of the STL Buoy alternative, all deepwater port technologies considered would have a permanent structure above the water’s surface, and therefore a permanent visual impact. The GBS and artificial island would need to be installed at shallower depths, and therefore closer to shore, making them easier to see than other structures out on the horizon. In addition, the GBS, artificial island and platform-based structure would need to be designed so that the lower deck would be at a higher elevation than the wave heights associated with the largest typical storm event. The HiLoad port design is a floating platform design, but due to its water depth requirements would be located far from shore and not likely be visible on the horizon. The FSRU and STL Buoy (during operations only) would resemble large vessels on the horizon, similar to the existing visual landscape.

Water Depth and Seafloor Topography

GBS terminals and artificial islands are generally constrained to shallower waters of less than 100 feet. Because of this, they would need to be constructed closer to shore. Conversely, the FSRU and STL Buoy technologies require deeper water to accommodate anchoring and flexible pipe connections. Platform-based units can also be constructed in much deeper waters; however, the design and construction costs of a platform of sufficient size could make it commercially unviable in deeper waters. The HiLoad port design can be constructed in water depths greater than 200 feet, but is optimal in water depths greater than 350 feet. A project located in waters of this depth would require additional construction costs and a longer pipeline from the platform to its interconnect point.

GBS terminals and artificial islands require areas where the seafloor is relatively level or gently sloping, lacking geologic hazards, and with satisfactory substrate characteristics to support the structure’s foundation and weight. Platform-based units have similar constraints to GBS terminals and artificial islands regarding the avoidance of geologic hazard areas. Conversely, anchored systems like the FSRU, HiLoad platform design and STL Buoy can accommodate differing substrate conditions. Several different types of anchoring systems allow for this flexibility.

Table 2.2-1. Evaluation of Deepwater Port Design Alternatives

Category	Topic	STL Buoy System(Proposed Project)	Gravity-Based Structure (GBS)	Platform-Based Unit	Floating Storage and Regasification Unit (FSRU)	Artificial Island	Hi-Load to Port Design
Environmental	Air Emissions a/	The relatively limited amount of construction required for the port and number of support vessels required during operations would result in lower emissions	Mobile emissions would be greater than the proposed Project due to the related ship maneuvers and tugs that would be required during both construction and operations.	Mobile emissions would be greater than the proposed Project due to the related ship maneuvers and tugs that would be required during both construction and operations.	Mobile emissions would be greater than the proposed Project due to the related ship maneuvers and tugs that would be required during operations.	Mobile emissions would be greater than the proposed Project due to the related ship maneuvers and tugs that would be required during both construction and operations	Greater emissions during operations due to electrical power required for LNG processing. To meet this power demand, the design would include 4 natural gas turbines (each rated at 10.5 MW) located aboard the floating regasification unit (FRU), in addition to 4 dual fueled (natural gas or diesel) turbines rated at 2.5 MW each for marine use. Mobile emissions would also likely be greater than the proposed Project due to the need for more constant use of a Carrier Assist Vessel to assist with connection to the Hi-Load, in addition to an offshore support service vessel to perform routine deliveries. Additional maintenance on an inherently more complex system would likely generate additional traffic.

Category	Topic	STL Buoy System(Proposed Project)	Gravity-Based Structure (GBS)	Platform-Based Unit	Floating Storage and Regasification Unit (FSRU)	Artificial Island	Hi-Load to Port Design
Environmental (cont'd)	Water Intake and Discharge	Selection of the closed loop vaporization system minimizes the amount of water intake and discharge that is required. Intakes are mostly limited to the LNGRVs and not the Port itself, and the LNGRVs have no discharges at the Port.	Likely requires a greater level of water intake and discharge than the proposed Project	Likely requires a greater level of water intake and discharge than the proposed Project	May require a greater level of water intake and discharge than the proposed Project (if recycled use of ballast water is not implemented)	Likely requires a greater level of water intake and discharge than the proposed Project	Similar to the proposed Project, the Hi-Load would utilize a closed-loop vaporization system (not water based). Intake of seawater would likely be greater than the proposed Project because in addition to ballast water intake, additional intake would be required for FRU operations (to supplement engine cooling approximately half of a year) and to seasonally supplement production of freshwater for crew use.
	Turbidity/ Sedimentation	Greater during operations than the other alternatives due to anchor chain sweeps and the flexible riser that is required.	Greater during construction than the proposed Project due to the considerable size of the footprint and the potential requirement to construct a graving dock.	Less during operations than the proposed Project due to a reduced number of anchors.	Similar to the proposed Project if anchor-based mooring system is used. Less than the proposed Project if the mooring tower or similar fixed structure is used (would eliminate chain sweeps).	Greater during construction than the proposed Project due to the considerable size of the footprint and the requirement to build up the island.	Similar to the proposed Project or less. Use of a mid-water buoy and a permanent FRU to suspend anchor chains and flexible risers may reduce drag in sediments.
	Sea Floor Removal – Benthic Habitat Loss (Permanent Structures)	Minimal sea floor conversion.	Greater footprint than the proposed Project.	Minimal sea floor conversion.	Minimal sea floor conversion.	Greater footprint than the proposed Project.	Minimal sea floor conversion.

Category	Topic	STL Buoy System(Proposed Project)	Gravity-Based Structure (GBS)	Platform-Based Unit	Floating Storage and Regasification Unit (FSRU)	Artificial Island	Hi-Load to Port Design
Environmental (cont'd)	Fisheries Impacts	May serve as a fish attractor and would result in lower entrainment/impingement impacts with the lower use of water.	May serve as a fish attractor and artificial reef; however, it also would be closer to shore and potentially limit more nearshore recreational fishing.	May serve as a fish attractor.	Water use would result in higher impingement/ entrainment impacts compared to the proposed Project and may serve as a fish attractor.	May serve as a fish attractor and an artificial reef; however, it also would be likely to be closer to shore and potentially limit more nearshore recreational fishing.	Greater than the proposed Project since additional seawater is expected to be required for FRU engine cooling and freshwater production. Other potential impacts include greater potential for entanglement from anchor mooring cables; greater potential for entanglement from pipes and power cables; and greater sustained and intermittent anthropogenic noises from the FRU hoteling, FRU DP adjustments, and the AAVs.
	Visual Resources	Minimal visibility compared to the other alternatives. The majority of the Port is only visible during active unloading.	Permanent above water structure with greater visibility than the proposed Project and would need to be located closer to shore.	Permanent above water structure with greater visibility than the proposed Project.	Permanent above water structure with greater visibility than the proposed Project.	Permanent above water structure with greater visibility than the proposed Project and likely would need to be located closer to shore.	Similar to the proposed Project, would likely be unseen from most shore vantage points but would have greater offshore impacts with constant, fixed, above surface structures.
	Shallow Water Impacts	Potentially less than the GBS or FSRU, because no graving dock is required.	Potentially greater than the proposed Project, because a graving dock may be required.	Potentially less than the GBS or FSRU, because no graving dock is required.	Potentially greater than the proposed Project, because a graving dock may be required.	Potentially less than the GBS or FSRU, because no graving dock is required. However, the source of the sediments might relate to shallow water impacts.	Similar to the proposed Project.

Category	Topic	STL Buoy System(Proposed Project)	Gravity-Based Structure (GBS)	Platform-Based Unit	Floating Storage and Regasification Unit (FSRU)	Artificial Island	Hi-Load to Port Design
Technical Considerations	Depth (feet)	Over 100.	Limited to 45-85.	Variable.	Generally over 100 feet.	Likely shallower than the proposed Project.	200-500 ft.
	Storage and Regasification Systems	No permanent facilities.	Permanent facilities.	Possible permanent facilities.	Permanent facilities.	Permanent facilities.	No storage but regasification facilities are permanent.
	Seafloor topography considerations	Yes – must have flat or gently sloping seafloor.	Yes – needs to support the foundation.	No	No	Yes – needs to support the foundation.	Flexible; only needed to assure proper anchorage.
Supply	Continuous or intermittent supply	Generally capable of a continuous supply, possibly constrained by weather related supply interruption and/or LNG availability.	Generally capable of a continuous supply; possibly constrained by storage capacity, weather related supply interruption and/or LNG availability.	Generally capable of a continuous supply; possibly constrained by storage capacity weather related supply interruption, and/or LNG availability.	Generally capable of a continuous supply; possibly constrained by storage capacity, weather related supply interruption, and/or LNG availability.	Generally capable of a continuous supply; possibly constrained by storage capacity, weather related supply interruption, and/or LNG availability.	Generally capable of a continuous supply; possibly constrained by storage capacity, weather related supply interruption, and/or LNG availability.
Operational Availability	Downtime during storm events	Reduced potential compared to an FSRU, because the vessel can weather vain.	Higher availability during adverse weather than the other alternatives, with the exception of an artificial island.	High potential due to mooring issues.	Higher potential due to the required side-by-side unloading from LNG carriers.	Highest availability during adverse weather than the other alternatives	Can weather vane similar to proposed Project under normal conditions. In severe weather, the FRU would likely have to be removed to safety, whereas the proposed Project can be lowered to the sea floor.

a/ Will depend on the actual system used (e.g., vaporization system, recycling systems).

Deepwater Port Design Conclusions

A GBS terminal and artificial island have several significant design disadvantages. These facility types must be sited in shallower water where nearshore habitats, recreational boating and fishing, and the visual landscape would be impacted. Construction of the graving dock facility required to support construction of the GBS would result in additional impacts on coastal resources. Also, GBS terminals have relatively high capital and construction costs compared to other designs. An artificial island would require the filling of up to 116 acres of open ocean. This would also come at a high cost and have a much larger impact area than other designs. For these reasons, the GBS and artificial island concepts were not carried forward for detailed review, and sites suitable for GBS and artificial island designs were not considered in further analysis of alternate port locations.

A platform-based unit would likely have more frequent interruptions of gas supply due to more operational limitations during heavy weather conditions. Additionally, the platform-based unit would not provide LNG storage facilities unless additional platforms were constructed, resulting in additional environmental impacts. Though the proposed Project does not include storage, the availability of two buoy systems allows for departure and arrival of two LNGRVs allowing for greater reliability. Therefore, the long-term reliability and associated commercial viability of the platform-based unit could fail to meet the objectives of the proposed Project. Thus, platform-based units were not carried forward for detailed review.

The HiLoad port design would have minimal impacts on the seafloor. This design is also highly reliable with the ability to perform in sea states up to 15 feet. Similar to the proposed Project, multiple HiLoad units could be installed for greater reliability without the need for storage. Because of the HiLoad platform design's optimal water depth of greater than 350 feet, the facility would be located far from shore eliminating any visual impacts. However, this would require a longer pipeline and would add to construction and operation costs. Also, minor water discharges would be required for operation. For these reasons, the HiLoad port design was not carried forward for detailed review.

The FSRU is a permanently moored vessel-like barge that can receive, store, and re-gasify LNG for delivery into a pipeline. Because it lacks its own propulsion, the FSRU requires a robust mooring system that is able to sustain extreme weather conditions including hurricanes. This robust mooring system would result in greater seafloor impacts. Additionally, if damaged during an extreme weather event, disruptions in gas delivery would likely occur while the FSRU is repaired. For these reasons, a permanently moored FSRU design was not carried forward for detailed review.

The STL Buoy design has a much smaller footprint than the other terminal designs. It also has design flexibility that allows it to be sited in deeper waters, increasing separation from nearshore resources, limiting visual impacts, and minimizing public safety concerns. This design would result in fewer impacts on the seafloor than other terminal designs. Because it would have multiple buoys, a continuous supply of natural gas could be delivered to the target market. Also, an LNGRV can be moored to the specially designed unloading buoys in higher wave conditions, reducing the susceptibility to operational downtime. Given the commercial, technical and environmental considerations, the STL Buoy was carried forward for detailed review.

2.2.1.3 Deepwater Port Location Alternatives

There are a large number of locations along the East Coast of the United States suitable for the siting of an LNG terminal, as evidenced by the two deepwater ports already constructed north of the proposed Project and the proposed and operating onshore LNG terminals along the coast. Liberty has identified lower New York and Long Island as their target market. Therefore, many of the proposed and constructed LNG terminals would not be feasible alternatives since they serve other markets than that proposed by Liberty.

In identifying a potential site for a LNG deepwater port terminal, applicable USCG siting guidelines (33 CFR 148.720) must be considered. These guidelines indicate that an appropriate site for a deepwater port:

- Optimizes location to prevent or minimize detrimental environmental effects;
- Minimizes the space needed for safe and efficient operation;
- Locates offshore components in areas with stable seafloor characteristics;
- Locates onshore components where stable foundations can be developed;
- Minimizes the potential for interference with its safe operation from existing offshore structures and activities;
- Minimizes the danger posed to safe navigation by surrounding water depths and currents;
- Avoids extensive dredging or removal of natural obstacles such as reefs;
- Minimizes the danger to the port, its components, and tankers calling at the port from storms, earthquakes, or other natural hazards;
- Maximizes the permitted use of existing work areas, facilities, and access routes;
- Minimizes the environmental impact of temporary work areas, facilities, and access routes;
- Maximizes the distance between the port and its components and critical habitats, including commercial and sport fisheries, threatened and endangered species habitats, wetlands, floodplains, coastal resources, marine management areas, and EFHs;
- Minimizes the displacement of existing and potential mining, oil, or gas production or transportation uses;
- Takes advantage of areas already allocated for similar use, without overusing such areas;
- Avoids permanent interference with natural processes or features that are important to natural currents and wave patterns; and
- Avoids dredging in areas where sediments contain high levels of heavy metals, biocides, oil or other pollutants or hazardous materials, and in areas designated as wetlands or other protected coastal resources.

The evaluation of alternative deepwater port locations used a screening and site selection process that considered several factors. The selection included the port’s proximity to shipping lanes, water depth requirements, proximity to target market, and proximity to existing offshore natural gas transmission infrastructure. These requirements resulted in four potential alternative sites:

- Study Area A – adjacent to the New Jersey coastline and immediately west of the outbound Barnegat Traffic Lane;
- Study Area B – located between the Barnegat and the Hudson Canyon Traffic Lanes;
- Study Area C – located between the Hudson Canyon and Nantucket Traffic Lanes; and
- Study Area D – passes between the Nantucket inbound traffic lane and the Long Island coastline.

These four alternative sites (Figure 2.2-1) were further evaluated based on safety, engineering, environmental, socioeconomic, vessel traffic, marine hazards and obstructions, commercial and recreational fishing resources, use conflicts, and regulatory concerns.

Table 2.2-2 provides an environmental evaluation summary for each of the proposed deepwater port location alternatives based on the specific environmental and technical considerations evaluated in the analysis of the deepwater port location alternatives.

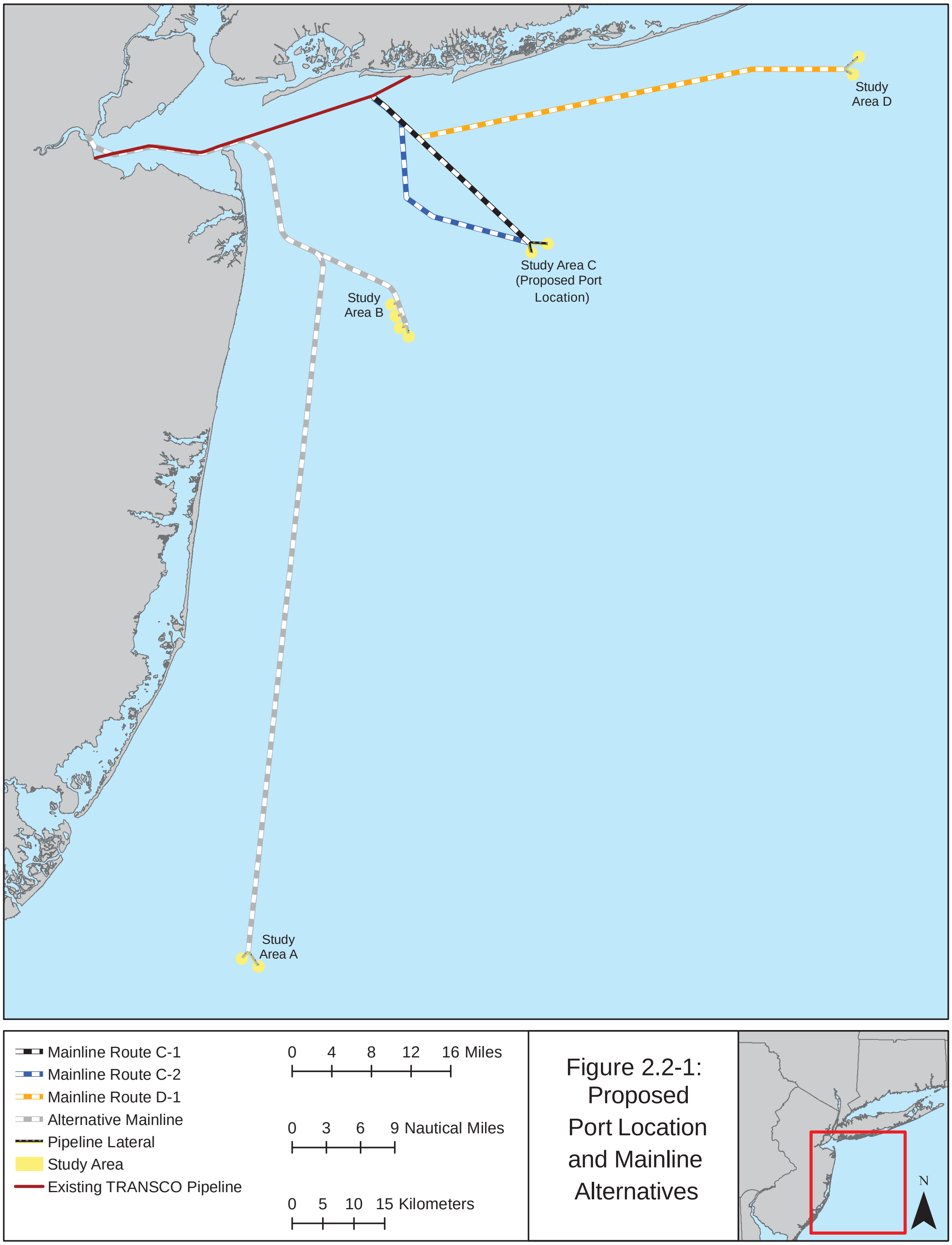

Figure 2.2-1. **Proposed Port Location and Mainline Alternatives**

Table 2.2-2. Evaluation of Port Study Areas

Category	Topic	Port Study Area			
		Area A	Area B	Area C	Area D
Regulatory Concerns	Stakeholder Concerns	Yes	Yes	None Reported	None Reported
Safety	Separation Distance between the Vessel Traffic Lanes and the Port	LNGRV visiting port will be required to cross at least one TSS lane	Maximum possible	Maximum possible	LNGRV visiting port will be required to cross at least one TSS lane
Engineering	Water Depth (feet) [Minimum required - 100 feet] a/	50 - 70	90 - 230	60 – >200	Targeted depth of 100 feet (30 m) only at the far eastern end of the Study Area
	Suitable Buoy Separation Distance Present	Yes	Yes	Yes	Yes
	Suitable Seabed Conditions	Yes; fine sands, medium fine sands, coarse sands, and scattered pebbles and cobbles.	Yes; fine sands, very fine sands, silts, and clay	Yes; fine to coarse sands and gravel	Yes; fine sands, medium fine sands, very fine sands, and scattered pebbles and cobbles
Socioeconomic	Population Proximity (Greater or Less than 15 miles (24 km) from shore)/ Visual Impacts b/	Less than 15 miles (24 km)	Greater than 15 miles (24 km)	Greater than 15 miles (24 km)	Less than 15 miles (24 km)
	Marine Recreation and Tourism	Impacts would be the same as the proposed Project	Impacts would be the same as the proposed Project	Short-term and minor	Close to designated recreational fishing area (Yankee Spot) along the NY shoreline.
Environmental Resources	Air and Noise Quality Impacts	Similar potential for all alternatives	Similar potential for all alternatives	Similar potential for all alternatives	Similar potential for all alternatives
	Proximity to Marine Protected Areas	Closer to Marine Protected Area	None in close proximity	None in close proximity	Close to Marine Protected Areas along the NY shoreline
	Water Quality/Sedimentation Impact Potential	Similar potential for all alternatives	Similar potential for all alternatives	Similar potential for all alternatives	Similar potential for all alternatives
	Proximity to Dump Sites	Avoids dump sites	Avoids dump sites	Avoids dump sites	Avoids dump sites
	Proximity to OCS Resources (Mineral Resources/Sand Borrow Areas)	Avoids sand borrow areas	Avoids sand borrow areas	Avoids sand borrow areas	Avoids sand borrow areas
Navigation and Vessel Traffic	Existing Ship Channels	Study Area A would require the LNGRV to cross the outgoing TSS lane when entering the DWP	Meets the general criterion of traffic avoidance and is located near designated traffic lanes providing direct access for LNGRVs to safely approach and depart from the DWP Area	Meets the general criterion of traffic avoidance and is located near designated traffic lanes providing direct access for LNGRVs to safely approach and depart from the DWP Area	Area D would require the LNGRV to cross the incoming TSS lane when departing the DWP

Category	Topic	Port Study Area			
		Area A	Area B	Area C	Area D
	Proximity to the Precautionary Area	Port is Outside of Precautionary Area	Port is Outside of Precautionary Area	Port is Outside of Precautionary Area	Port is Outside of Precautionary Area
	Proximity to Anchorage Areas	Avoids Anchorage Areas	Avoids Anchorage Areas	Avoids Anchorage Areas	Avoids Anchorage Areas
Marine Hazards and Obstructions	NOAA automated Wreck and Obstruction Information System	Favorable for avoidance	Favorable for avoidance	Favorable for avoidance	Favorable for avoidance
	Seismic, Electromagnetic and Radioactive Activities	None Identified	None Identified	None Identified	None Identified
Commercial and Recreational Fishing	Proximity to Sport Fishing Grounds	Several in close proximity	In close proximity to the Mud Hole and other fishing Areas	Avoids Designated Fishing Areas	Within Designated Fishing Area
	Proximity to Essential Fish Habitat	Similar EFH regardless of Site Alternative	Similar EFH regardless of Site Alternative	Similar EFH regardless of Site Alternative	Similar EFH regardless of Site Alternative
	Proximity to Artificial Reefs	None crossed by potential Port location	None crossed by potential Port location	None crossed by potential Port location	None crossed by potential Port location
Use Conflicts	Proximity to OCS leases for oil, gas or wind	Avoids lease areas	Avoids lease areas	Application for lease filed September 8, 2011, for wind farm by LI-NYC Offshore Collaborative	Avoids lease areas
	Restricted/Prohibited Airspace (Military Operations)	Avoids Restricted Airspace	Avoids Restricted Airspace	Avoids Restricted Airspace	Within Restricted Airspace

Key:
000 Key (Fatal Flaw) Criteria
000 Pass Criteria
000 Pass Criteria with Limitations
000 Failed Key Criteria (Eliminated from further evaluation)
000 Criteria Not Analyzed Further for a Site Due to Key Criteria Not Being Met

Notes:
a/ Discussions with APL (Submerged Turret Loading Buoy suppliers) indicated the minimum water depth required to support safe operation of their buoy design is roughly 100 feet water depth.
b/ At this distance, the LNGRV will be below the horizon or blend with other vessels that typically transit the area inshore of the Port.

Source: NOAA 201 2a,b.

In 2010, Liberty proposed a different project that was located within Study Area B (Liberty Offshore Project). According to Liberty's Natural Gas Revised Application submitted on November 29, 2011 (available under Docket USCG-2010-0993), the Liberty Offshore Project was proposed for location in federal waters roughly 13.9 nautical miles offshore of Asbury Park, New Jersey and approximately 21.7 nautical miles offshore of Rockaway, New York. Natural gas would be delivered through the STL Buoy systems and laterals into a buried 25.8 mile subsea pipeline, which would connect with an existing subsea natural gas pipeline system for delivery to shore. The STL Buoy systems would be located in water depths of approximately 103 and 113 feet and would be lowered to rest on a landing pad on the ocean floor when not in use.

Safety

Safety is an important consideration when evaluating alternative deepwater port locations. In the case of the proposed Project, safety of the LNGRVs entering the port and during offloading is of primary interest. Also of interest is the safety of the proposed Port facilities while idle. Therefore, the main criterion in evaluating the safety of alternative deepwater port locations was the separation distance between the vessel traffic lanes and the proposed Port facilities.

To improve protection of the proposed Port facilities and LNGRVs visiting the Port, the STL Buoys would need to be centralized to the furthest extent possible between adjacent traffic lanes to maximize the separation of the Port and normal vessel traffic. Through analysis of potential STL Buoy locations and vessel traffic lanes, it was determined that LNGRVs calling on Study Areas B and C would not need to cross any vessel traffic lane to deliver cargo, whereas Study Area D would require the LNGRVs to cross at least one vessel traffic lane.

In addition to safety concerns regarding the proposed Port facilities, safety of populated areas in the proximity of the Port facilities was also considered. One of the primary purposes for locating a LNG terminal offshore is to distance the terminal from populated areas to diminish potential safety risks associated with this type of project. Study Area D is located between New York's 3-nautical-mile state water jurisdictional boundary and the Nantucket to Ambrose Traffic Lane. At the closest point to shore, Study Area B is approximately 13.9 nautical miles from the shore, and Study Area C is approximately 13 nautical miles from the shore.

Engineering

Though alternative sites may be more environmentally preferable, constructability constraints determine the overall feasibility of a site. Several criteria can be used to determine the constructability of a site, including water depth, buoy separation distance and seabed conditions.

The STL Buoys require a minimum water depth of 100 feet to provide adequate clearance between the disconnected buoy and the LNGRV prior to mating. In addition, seabed conditions must allow for anchoring of the proposed Port facilities. Study Areas B, C, and D meet these requirements.

Environmental

Environmental impacts are one of the primary reasons for avoiding certain locations and choosing others. These resources are discussed in more detail in Section 3 and 4; however, several considerations, including air and noise quality impacts, avoidance of marine protected areas (MPA), avoidance of important commercial and/or recreational fisheries, avoidance of disposal areas, and avoidance of OCS resources, were evaluated.

Study Areas B, C, and D are similar in regards to impacts on air and noise quality, avoidance of MPA, and avoidance of disposal areas and OCS resources, which would not likely make one site more environmentally preferable to the other.

Socioeconomic

Though similar to considerations identified for safety, proximity to populated areas and marine recreation and tourism were analyzed from a socioeconomic perspective. A distance of 13 nautical miles was determined to be an adequate distance to address concerns regarding proximity to populated areas and visual impacts. Also, by maximizing the distance from shore, recreational fishing areas could more easily be avoided.

Study Area D is approximately 4.78 nautical miles closer in proximity to populated areas than Study Area C. Though Study Area D is closer, visual impacts from either location would be similar as LNGRVs would be difficult to see from shore. Impacts on marine recreation and tourism would be similar for Study Areas B, C, and D; however Study Area B is closer to “Mud Hole”, a popular fishing ground located at the north end of the subsea Hudson Valley area that has been reported to support high levels of commercial fish species. The associated proposed Mainline route for Study Area B is unable to avoid crossing a portion of the “Mud Hole.”

Vessel Traffic

Though the preferred location of the proposed Project would be to avoid existing ship channels and create separation from the traffic lanes, it is also required for safety reasons. In addition, Precautionary and Anchorage Areas need to be avoided.

Study Areas C and D both meet the avoidance criteria to existing ship channels; however, Study Area D would require the LNGRVs to cross the incoming vessel traffic lane when departing the proposed Port facilities. Study Area C would not require LNGRVs to cross the vessel traffic lane. Study Areas B, C, and D avoid Precautionary and Anchorage Areas.

Marine Hazards and Obstructions

Marine hazards and obstructions can represent many things, including boulders, scrap metal, abandoned structures, shipwrecks, or other hazardous objects. They could also include danger areas where explosive material or detrimental seismic, electromagnetic, or radioactive areas can be found. These types of areas can preclude the siting of a LNG terminal.

Study Areas B, C, and D avoid anomalies such as boulders, scrap metal, abandoned structures, shipwrecks, and similar hazardous objects. Further, Study Areas B, C, and D avoid locations of detrimental seismic, electromagnetic or radioactive activities.

Commercial and Recreational Fishing Resources

When siting an offshore LNG terminal, it is important to consider impacts on commercial and recreational fishery resources. Impacts on these industries could have a socioeconomic impact on the region. Also, avoidance of designated fishing areas ensures that habitat needed to support commercial or recreational fish species is unaffected.

Study Areas B, C, and D are located in relatively close proximately to one another; therefore, impacts on EFH would be anticipated to be similar. In addition to EFH, avoidance of sport fishing grounds was also considered. Study Area C is located outside of all known sport fishing grounds. Conversely, Study Area B is located adjacent to a popular commercial fishing ground referred to as the “Mud Hole” and Study Area D is located within a large sport fishing ground referred to as the “Yankee Spot.”

Use Conflicts

Use conflicts could include prior or existing leases or military use areas. These could result in an area not available for the proposed Project or safety concerns that may arise through different uses in close proximity to one another.

Study Area B is not located in an area with use conflicts; however, the associated proposed Mainline route for Study Area B crosses a popular fishing ground referred to as the “Mud Hole” and passes immediately adjacent to two potential use conflicts including a designated pilot transfer area and a disposal area. Study Areas C and D are sited in areas with use conflicts. Study Area C is located within a potential 127-square mile wind farm area. The Long Island – New York City Offshore Wind Collaborative filed a lease application with the BOEM, but design specifications of the wind farm have not been provided to date. Study Area D is located within a Restricted/Prohibited Airspace (Military Operations) area. Further consultation would be necessary to determine use restrictions at this location.

Alternative Port Locations Considered but Not Further Analyzed

Based on initial review, it was determined that Study Area A did not meet all the requirements and was eliminated from further evaluation. Study Area A was eliminated due to inadequate water depth and because it did not meet the minimum distance from shore that was determined where LNGRVs would blend in with other vessels, thereby reducing visual impacts. Selection of Study Area A would also have resulted in increased socioeconomic impacts due to closer proximity to the nearest coast. Finally, Study Area A was determined to be a navigation risk due to LNGRVs crossing the outgoing Traffic Separation Scheme (TSS) while calling on the proposed Port.

Deepwater Port Location Alternatives Conclusions

Of the remaining alternative deepwater port locations, Study Areas B and C do not require LNGRVs to cross any TSS, as vessels would likely follow existing inbound traffic lanes to approach these locations, and use outbound traffic lanes during departure. From a safety consideration, Study Area D would require crossing at least one TSS by LNGRVs calling on the proposed Port. Evaluation of engineering criteria has determined that minimum depth requirements are satisfied by Study Areas B, C, and D, considering bathymetry in both areas ranges well over 100 feet. Further seabed evaluations such as geophysical and geotechnical surveys would be required to determine constructability; however, it is anticipated that seabed conditions would be similar at Study Areas B, C, and D. Study Areas B, C, and D also avoid known marine hazards and obstructions. While engineering and seafloor considerations for both sites are similar, the distance of Study Areas B and C is greater than 13 nautical miles; therefore, associated socioeconomic, visual, use conflicts, commercial and recreational fishing, and environmental impacts are likely minimized. However, the associated proposed Mainline route for Study Area B would cross a popular fishing ground referred to as the “Mud Hole” and would be immediately adjacent to a designated pilot transfer area and a disposal area. Proposed Mainline routes C-1 and C-2, discussed in Section 2.2.1.4, avoid known fishing grounds and disposal areas. Based on the above criteria, the Applicant has determined Study Area C to be their proposed Port location.

2.2.1.4 Anchor Alternatives

Selection of the optimal anchor design depends on the consideration of multiple environmental and technical factors. Seven environmental and technical considerations were evaluated in this analysis including:

- Air emissions;
- Water use and discharge;
- Turbidity, sedimentation, and seafloor impacts;
- Fisheries impacts;
- Noise impacts;
- Decommissioning impacts; and
- General technical considerations.

Five different anchor designs were considered in the alternatives analysis for the proposed Project. The design alternatives included: (1) suction anchors; (2) driven piles; (3) fluke anchors; (4) gravity-based anchors; and (5) grouted pile anchors.

Suction Anchors

A suction anchor consists of a high-grade steel caisson or "upside down bucket" with an outer diameter of 26 to 46 feet, a skirt length of 33 feet, and a weight of approximately 50 to 90 tonnes. The suction anchor would be embedded in the sediments by pumping out water and creating a negative pressure inside the caisson skirt. Suction anchors are best used in clay and fine sediment conditions, with few sediment layers. Installation of suction anchors is sensitive to water depth as the installation relies upon the section pressure being built up within the anchor and the pressure of the given water column above to overcome the resistance in the sediment.

Driven Piles

A driven pile consists of a high-grade steel pile with an outer diameter of 6 to 7 feet, a pile length of 82 feet, wall thickness of 2 to 4 inches, and an approximate weight of 45 to 70 tonnes. Driven piles are generally used in conditions consisting of non-cohesive sediments, such as sand or silt, or in stratified soil conditions. Driven pile installation is not sensitive to water depth as a hydraulic hammer would drive the pile down to the target depth.

Fluke Anchors

Fluke anchors are typically steel structure with some sort of hook or fluke. They derive a significant portion of their holding power from hooking or embedding in the bottom, with a secondary reliance on their mass. Where fluke anchors are used, special attention must be paid to anchor positioning and tensioning. When used in soft sediments, these anchors are dragged down into the sediments and their holding capacity is dependent upon the subsequent level of tensioning. Fluke anchors are more effective when wedged between rock ledges or fractures where the stability of the rock formation is able to lock the flukes.

Gravity-Based Anchors

Gravity-based anchors use large masses, commonly a block or slab of reinforced concrete resting on the seabed. Smaller anchors may be lowered into the seabed by jetting so they are flush with or just below the surface. Since the STL mooring anchor requires a characteristic holding capacity of 700 tonnes for the mooring systems, the size of the structures required to achieve the required holding capacity would have to be substantial.

Grouted Pile Anchors

Grouted piles are similar to driven piles, but installed differently. If the sediment condition consists of cemented soil layers and/or rock material, grouted piles may be required, as these materials limit the amount of penetration with driving hammers. A hole for the pile would be drilled into the seafloor to achieve the penetration of the grouted pile anchor. Grout is then pumped in between the soil/cemented wall and the pile.

Air Emissions

Air emissions would vary only slightly for each alternative, mostly attributable to the number and type of support vessels used. Pile or fluke anchors would result in less air emissions due to the decreased number of required ship transits during construction. For gravity-based anchors, the impacts of transportation and placement of multiple oversized gravity-based anchors from onshore facilities to the Port area would result in the greatest impact from air emissions for the alternatives considered in this analysis.

Water Use and Discharge

As with air emissions, water use and discharge would vary only slightly for each alternative, mostly attributable to the number of support vessels required for construction. Installation of suction, pile, or fluke anchors would result in lower water use and discharge than installation of the gravity-based anchor due to the decreased number of required ship transits during construction.

Turbidity, Sedimentation, and Seafloor Impacts

During installation, all anchor alternatives would have short-term turbidity and sedimentation impacts. These impacts would be limited to the duration of installation. It is anticipated that driven piles would have the smallest footprint; therefore, installation of driven piles would result in significantly less of an effect on benthic habitat. Installation of a gravity-based anchor would result in the greatest disturbance due to a larger footprint, followed by the fluke anchor system, which would result in disturbance due to the necessary pulling of the anchor in the seafloor.

Fisheries Impacts

It is anticipated that driven piles would have the smallest footprint; therefore, installation of driven piles would result in significantly less of an effect on fisheries. Suction anchors, by virtue of pumping out water from inside the caisson would have an impact on the zooplankton within that water column, which the other alternatives avoid. Gravity-based anchor structures would result in a direct loss of existing fish habitat in a significant area, approximately 2,500 square feet per anchor structure. However, the gravity-based anchor system structures would provide a significant amount of hard substrate at different depth which would likely result in an artificial reef sustaining development of new biotic communities that have a potential to support significant marine populations. Such gravity-based anchor reefs would not be available to commercial and recreational fisherman so would not result in any direct positive economic impact.

Noise Impacts

For suction anchor and gravity-based anchors, sound generated by support vessel and barge movements and the thrusters of DP vessels would be the dominant source of underwater noise during anchor installation activities. An increase in underwater noise would be anticipated with grouted piles, mostly attributable to the use of drilling equipment. Noise impacts are expected to be greatest for driven piles due to the pulsed sounds of the hammer striking the pile. All noise impacts would be temporary for the duration of the installation, approximately 16 days.

Decommissioning Impacts

During decommissioning, driven pile and grouted pile anchors would be cut below the surface and abandoned in place. There would be a short-term and minor disturbance to surface sediments during this activity. Fluke anchors could be similarly abandoned in place with little disturbance to sediments, or backed out and recovered, resulting in moderate disturbance to sediments, benthic habitat, and increased turbidity. If backed out, the area would recover in a short while and represent pre-construction condition. The suction anchor could also be abandoned in place with little disturbance to sediments, or backed out and recovered, resulting in moderate disturbance to sediments, benthic habitat, zooplankton, and increased turbidity. Backing out the suction anchor, achieved by pumping seawater into the caisson to pressurize and raise the anchor, would also result in further entrainment impacts. It is expected that this impact would be temporary as the area would recover to pre-construction conditions. For gravity-based anchors, it is likely that they would be abandoned in place since it would not be practicable to attempt recovery. They would however have been transformed into artificial reef habitat over the 30-year Project life expectancy. Because all safety exclusion zones would be removed, these artificial reefs would be available to the public, including divers and commercial and recreational fishermen. Bottom trawling in the post-Port area would likely still be excluded because of the potential for net entanglement.

General Technical Considerations

As stated above, suction anchors are mostly used in clay and fine sediment conditions with few soil stratifications. Installation of the suction anchor system is sensitive to water depth. Driven piles are generally used in sediment conditions consisting of more non-cohesive soil such as sand, silt, and/or more stratified conditions. Driven pile installation is not sensitive to water depth. Fluke anchors can be used in various sediment conditions; however, there are limitations due to the actual anchor location and sediment holding capacity. Holding capacity is dependent upon the level of tensioning. For the proposed Project, tensioning of the anchors up to 700 tonnes would be required. Since the STL mooring anchor requires a characteristic holding capacity of 700 tonnes at the anchors for the mooring systems, the gravity-based anchor system is not a viable alternative. The size of the structure required to achieve the required holding capacity results in the gravity-based anchor being the least favorable alternative. Finally, the grouted pile anchor alternative would be similar to the driven pile system except it would require a different installation method. Selection of this method would be dependent upon seabed composition with rockier, more consolidated soils resulted in the selection of the grouted pile system.

Anchor Alternatives Conclusions

Given the environmental and technical considerations, the driven pile and suction anchor systems are characterized by several key advantages including a smaller footprint and decreased number of required support vessel transits during installation. Suction anchors are mostly used in a clay and fine sediment soil condition with limited stratification. Driven piles are generally used in sediment conditions consisting of more non-cohesive soil, such as sand, silt, and/or a more stratified conditions. Future geotechnical survey testing would be necessary in the anchor area and must reach down to at least the anticipated depth of pile penetration.

2.2.1.5 Mainline Alternatives

Selection of the optimal mainline route depends on consideration of any of the same evaluation criteria that were used for evaluation of the Study Areas. Seven environmental and technical considerations were evaluated in this analysis including:

- Engineering;
- Marine hazards and obstructions;
- Socioeconomics;
- Environmental resources;
- Navigation and vessel traffic;
- Commercial and recreational fishing; and
- Use conflicts.

Two Mainline routes (Figure 2.2-1) were analyzed for the proposed Project. As discussed in Section 2.2.1.3, Study Area A was eliminated due to inadequate water depth and because it did not meet the minimum distance from shore that was determined where LNGRVs would blend in with other vessels, thereby reducing visual impacts. The Applicant has determined Study Area C to be the proposed Port location because Study Area B would require crossing a popular fishing ground referred to as the “Mud Hole” and would be immediately adjacent to a designated pilot transfer area and a disposal area, and Study Area D would require crossing at least one TSS by LNGRVs calling on the proposed Port, as well as a popular fishing ground known as the “Yankee Spot.” Additionally, a Mainline route in Study Area D would be nearly twice as long as Mainline routes from Study Area C, which would result in greater seabed impacts, increased turbidity and associated water quality impacts. Therefore, both Mainline routes analyzed below are located in Study Area C. The proposed Mainline route alternatives considered are as follows:

- Mainline Route C-1 – Head northwest from Study Area C for approximately 16.8 nautical miles where it would cross into state waters. From the boundary of state waters, the route would continue northwest for approximately 2.1 nautical miles to the intersection with the Transco Lower New York Bay Lateral; and
- Mainline Route C-2 – From Study Area C, it would follow along the west side of Mainline Route C-1 avoiding the Cholera Bank fishing area and then merging back into Mainline Route C-1 after approximately 15.4 nautical miles. Mainline Route C-2 would then overlap Mainline Route C-1 until the intersection with the Transco Lower New York Bay Lateral.

Engineering

Several criteria can be used to determine the constructability of a pipeline route. Generally, the shortest possible distance is preferable to reduce potential impacts on the seabed and for cost considerations. In addition to pipeline length, the number of foreign crossings was evaluated. Seabed conditions were also considered to ensure that the substrate could support the pipeline structure while avoiding or minimizing bathymetric and subsurface irregularities.

Marine Hazards and Obstructions

As previously discussed, marine hazards and obstructions can represent many things, including boulders, scrap metal, abandoned structures, shipwrecks, or other hazardous objects. They could also include danger areas where explosive material or detrimental seismic, electromagnetic, or radioactive areas can be found. For safety and other reasons, siting of a pipeline route should avoid these areas.

Socioeconomics

To the extent practicable, the Mainline should be sited to avoid interference with recreational shorelines or waterways; minimize impairment to recreational fishing activities and other water-dependent uses; and minimize the alteration or impairment of visual landscape, scenic quality, or aesthetic value.

Environmental Resources

Siting a pipeline through disposal areas, OCS resources, cultural resources, MPA, or areas susceptible to water quality and sedimentation can have adverse environmental impacts. Though it is often not possible to avoid impacts on all of these areas, selecting a route that minimizes impacts to the extent practicable is environmentally preferable. Additional information on these resources is provided in Sections 3 and 4.

Navigation and Vessel Traffic

The primary concerns regarding Mainline siting and navigation and vessel traffic would be during construction and decommissioning of the Mainline or if maintenance activities were required. A preferable route would minimize impacts on traffic separation lanes and shipping channels, avoid Precautionary and Anchorage Areas, and avoid Lightering Zones.

Commercial and Recreational Fishing

As with environmental resources, siting a pipeline through sport fishing grounds, artificial reefs, or EFH could have adverse environmental impacts. Primary impacts would be from alteration of seabed conditions that support recreational or commercial fish species.

Use Conflicts

The same use conflicts that applied to the Study Areas would also apply to the proposed Mainline route. Avoidance of OCS leases for oil, gas, or renewable energy projects, and avoidance of restricted military use areas would avoid potential use conflicts.

Mainline Alternative Conclusions

Mainline Route C-1 and Mainline Route C-2 are similar for the majority of their route and overlap for the last approximately 3.5 nautical miles. Mainline Route C-2 is approximately 2.6 nautical miles longer than Mainline Route C-1; however, construction time frame and additional costs would not be a major factor in determining a preferable route. Due to its additional length, Mainline Route C-2 would result in additional seabed impacts. In addition to seabed impacts, Mainline Route C-2 is closer to the Cholera Bank designated fishing grounds and crosses three additional out-of-service subsea utility lines. Mainline Route C-1 would overlap with the lease blocks associated with the proposed Long Island-New York City Offshore Wind Project.

Mainline Route C-1 is an environmentally preferable route to Mainline Route C-2. It has a shorter distance and avoids several resources that would be crossed by Mainline Route C-2.

2.2.1.6 Onshore Pipe Staging and CWC Facility Alternatives

Liberty is currently reviewing a site on Quonset Point, Rhode Island, and a site on Port of Coeymans, New York, as potential locations for a pipe staging and CWC facility. Onshore pipe staging and CWC facility alternatives were evaluated using the following criteria:

- 10-12 acres of stabilized land for CWC plants and pipe staging including:
    - Five (5) acres for plant footprint;
    - Six (6) acres for pipe laydown and staging; and
    - Raw material storage including sand, cement and iron ore.
- Stabilized land for ground transport;
- Rail access to receive pipe; and,
- Water access for loading pipe to barges, including:
    - Minimum requirement of 300 linear feet of water front access;
    - Dock or bulkhead suitable to support an 80 ton crane; and
    - Minimum water depth of 12 to 15 feet at the loading area.

The Quonset Point site is located in North Kingstown, Rhode Island, approximately 135 miles north of the Port of New York and New Jersey. The Quonset Business Park® is "designed to provide prime sites for quality industrial development, offices, education, and marine industry, to create new job opportunities for Rhode Island workers; and to be sensitive to the built and natural environment" (Quonset Development Corporation 2011). The Quonset Point location has access to Narragansett Bay, which would accommodate the marine transportation aspect of the construction activities. There has been prior FERC approval for use of this location in other, similar construction projects including the Northeast Gateway Deepwater Port Project (USCG Docket Number USCG-2005-22219) and the HubLine Pipeline Project (FERC Docket Numbers CP01-5-000 and CP01-5-001).

The Port of Coeymans site is located in the town of Coeymans, New York on the west side of the Hudson River, approximately 155 miles north of New York Harbor, and consists of six possible locations. Five of the locations, located between the Hudson River and Route 115, have been heavily mined, filled and graded in connection with the property's extensive industrial history. The sixth location, located on the east side of Route 114, is a large, mostly level field. The Port of Coeymans Marine Terminal is a 400-acre marine terminal that offers dock capability for ships up to 750 feet with a draft of 32 feet. The Port of Coeymans Marine Terminal offers heavy lift capacity, barge rentals, tug services, specialty lifts, stevedoring services, trucking, dredging and dock rehabilitation and is a secure Maritime Security Level facility. The Port of Coeymans site has been used for many of the same functions and uses as would be required for the proposed Project including a large prefabrication project, the Willis Avenue Bridge, for New York City (Port of Coeymans Marine Terminal 2014).

Onshore Pipe Staging and CWC Facility Alternative Conclusions

Both onshore pipe staging and CWC facility locations would meet the key size and water access requirements and would be considered viable sites. The Quonset Point facility has FERC prior approval for the type of use and accessibility for the proposed Project. Use of either alternative would be consistent with the designated land use and planning for the property and adjacent properties. Since all of the onshore construction yard sites are located at existing industrial facilities, the following environmental resources would not be impacted: biological, cultural and geological resources; recreation and aesthetics; transportation; noise; land and ocean use. Liberty is continuing to review additional sites and would select a suitable location for a pipe staging and CWC facility during the development phase of the proposed Project.

2.2.1.7 LNG Vaporization Technology Alternatives

Prior to delivery to the proposed Mainline system, LNG must be vaporized and converted to natural gas. Two system alternatives are available for this process: open-loop and closed-loop. The primary difference between the two systems is that the closed-loop system does not require the intake or discharge of seawater, whereas the open-loop system uses a once-through system requiring both intake and discharge of seawater during operation. Table 2.2-3 provides the evaluation of the alternative vaporizer process.

Table 2.2-3. Evaluation of Alternative Vaporizer Process

Criteria	Closed Loop	Open Loop
Air Emissions	Nitrogen oxides, carbon monoxide, carbon dioxide production from combustion.	No air emissions during summer (warm water temperature) months. Supplemental heating during other periods results in similar air emissions.
Other Environmental Considerations	No cooling water discharge, due to recirculating ballast water for LNGRV cooling needs; generally found acceptable by regulatory agencies.	Localized lower seawater temperature and impingement and entrainment of marine organisms; generally found not acceptable by regulatory agencies.
Reliability	High.	High during summer months; low during most of the rest of the year due to the need for integrating supplemental heat.
Maintenance	Higher instrumentation levels.	Low during summer months; higher during most of the rest of the year due to the need for integrating supplemental heat.
Control	More complex due to the use of ballast water.	Simple during summer months; more complex during most of the rest of the year due to the need for integrating supplemental heat.

Under the open-loop system approach, seawater is pumped through a heat exchanger to warm an intermediate fluid, such as propane or a water/glycol mixture. The intermediate fluid is then circulated over a tube bundle containing LNG. The heated intermediate fluid vaporizes the LNG and is returned to the seawater heat exchanger to be reheated. To prevent marine growth, the use of biocides as anti-fouling agents are employed. The open-loop system would use large volumes of seawater, approximately 13,944 to 27,932 gpm as an indirect heat source for LNG vaporization. This intake, and ultimate discharge, could have impacts on marine biota. The intake of seawater could impinge or entrain organisms, while the discharge or cooled, treated seawater could affect marine life and water quality. In addition, the lower seawater temperatures in the Atlantic Ocean during the fall and winter could affect the efficiency of the open-loop system and require supplemental heating to vaporize the LNG, thereby resulting in additional air impacts.

Within the closed-loop and open-loop system processes, there are four specific technologies available that are commercially available for use at an existing LNG terminal or approved for use in a deepwater port license application. The technologies may have the ability to operate with either a closed-loop or open-loop system and include:

- Ambient Air Vaporizers (AAV) (closed-loop) – AAV technology uses air as the heat source to vaporize LNG. The LNG is distributed through a series of surface heat exchangers, where the air travels down and out the bottom of the vaporizer. AAV is best suited for locations with warmer ambient temperatures; in cooler climates, a supplemental heat system would be necessary. These systems also require a much larger area than typical water-based systems with smaller heat transfer surface area requirements. Although there is no seawater intake, the process of cooling ambient air, which condenses into freshwater, necessitates treatment to prevent bio-fouling in the freshwater discharge piping.

- Shell and Tube Vaporizers (STV) (may be configured to operate in an open-loop or closed-loop mode depending on the source of heat used for warming the intermediate fluid) – LNG passes through multiple tubes while seawater enters a shell surrounding the tubes. The open-loop configuration may or may not require combustion for supplemental heating depending on the seawater temperature. A closed-loop system uses auxiliary boilers to heat an intermediate fluid to transfer heat. The intermediate fluid flows through a heat exchanger to absorb heat from steam produced by the boilers, then the fluid passes through the STV unit to re-gasify the LNG.

- Submerged Combustion Vaporizers (SCV) (closed-loop) – A natural gas-fueled burner is utilized, where hot exhaust gas from a fuel-air combustion chamber directly heats a bath of water by bubbling through the water to the exhaust stack. The heated water bath provides the heat to vaporize the LNG flowing inside the tubes. Each SCV requires a high-pressure, electric motor-driven air blower to support the combustion process and to force the combustion flue gas through the water bath. It is necessary to add chemicals to the water bath (since it becomes acidic as the combustion products are absorbed during the heating process); the excess combustion water must be neutralized prior to discharge.

- Open Rack Vaporizers (ORV) (open-loop) – ORV use seawater as the thermal energy source in a direct heat system to vaporize the LNG. To control algae growth within the system, chlorine is injected on the intake side of the system. The treated seawater is then pumped to the top of the water box and travels down along the outer surface of the tube heat exchanger panels, while LNG flows upward through these tubes and is vaporized. Because this technology relies on seawater as the primary heat source, it is only effective where seawater temperatures exceed approximately 63°F.

A closed-loop system would generate slightly more air impacts than an open-loop system, but would not have any intake or discharge of seawater. The closed-loop system relies on the combustion of natural gas to heat and vaporize the LNG. Closed-loop systems typically burn up to 1.5 percent of the LNG throughput and allow for some efficiency in the recovery of BOG. Though they do have additional emissions, particularly NO_x, control devices are available to greatly reduce those emissions.

The closed-loop system would ultimately result in fewer impacts on marine systems and water quality. Though this system could result in greater air emissions, it is likely that the open-loop system would result in additional air emissions from supplemental heating required during the colder months, often when additional supply would be required for the target market. Therefore, the closed-loop system was chosen as the environmentally preferable vaporization process.

Three specific technologies operate in the closed-loop system. The AAV technology is better suited for warmer climates where the temperature would preclude the need of an additional heat source to maintain effective use and thereby leading to additional air emissions. Additionally, frost build-up on the vaporizer could reduce performance. The SCV technology produces the greatest air emissions of the closed-loop technologies. Added pollution controls would be required aboard the LNGRV. The LNGRV would not have the space onboard required for the necessary pollution controls. Therefore, the use of the STV technology would be the most environmentally preferable technology.

2.2.2 No Action Alternative

The No Action Alternative refers to the continuation of existing conditions of the affected environment, without implementation of the proposed Project. Inclusion of the No Action Alternative is prescribed by the Council on Environmental Quality's (CEQ) NEPA implementing regulations and serves as a benchmark against which federal actions can be evaluated. Under the No Action Alternative, the infrastructure proposed by Liberty would not be built or brought on-line, and the potential positive or negative environmental impacts identified in this draft EIS would not occur. However, the demand for additional energy in general, and specifically natural gas, would not be satisfied by the proposed Project. Proposed onshore and offshore LNG terminal facilities are considered independent of one another (not mutually exclusive), and for that reason are not considered to represent true alternatives to each other. Onshore LNG terminal facilities are discussed under the No Action Alternative because they could be developed regardless of the outcome of any proposed DWPA application.

Similarly, if the Secretary were to deny or postpone Liberty's DWPA license application, potential natural gas customers could be forced to seek regulatory approval to use other forms of energy. Other license or certificate applications concerning proposals to satisfy demand for natural gas might be submitted to the Secretary or the Secretary of the FERC, or other means might be used to satisfy the demand for energy in the United States, such as expansion or establishment of onshore LNG import terminals.

Although development of an onshore LNG terminal is not considered a true alternative to the proposed Project, an analysis of onshore LNG terminal siting alternatives is presented below.

Development of an onshore LNG terminal would require construction of LNG import facilities, including storage tanks, vaporization facilities, and compression facilities. The onshore LNG terminal would also require the construction of an onshore sendout pipeline to transfer the vaporized natural gas to the interconnect point with an existing system. In addition to the onshore requirements, the facility would require access to a deepwater port or other waterway to allow LNG vessels to call on the facility and deliver the LNG. Federal safety requirements (National Fire Protection Association 59A) would also consider sufficient applicant-controlled land area to accommodate a site-specific onshore exclusion zone.

Typical LNG vessels require approximately 44 feet of water depth for safe approach and berthing. If ports or harbors that can meet this depth are unavailable, and dredging is not an option, LNG can be transported to onshore facilities via a cryogenic pipeline. This would allow the majority of the processing equipment to remain onshore while the LNG vessel remains at a dedicated mooring site to unload its cargo. However, engineering factors such as cryogenic and pressure requirements limit cryogenic pipelines to approximately 3 miles.

The natural gas demands in the lower New York and Long Island market are expected to exceed the available supply, especially during times of peak demand. The existing natural gas infrastructure that serves the target market are highly constrained and require expansion to meet the current demand. Should the No Action Alternative be adopted, potential customers could select other available energy alternatives, such as oil, coal, nuclear, or renewable or other alternative sources. In addition, they could seek traditional non-LNG-derived natural gas to compensate for the reduced availability of natural gas to be supplied by the proposed Project. The No Action Alternative would avoid the potential for environmental impacts associated with proposed Project construction and operation. Failure to provide additional LNG to the domestic market would cause reliance on other natural gas sources and increased process or shortages for industrial use and electricity generation. As discussed below, use of other fuel sources could result in a wide range of positive or negative economic and environmental effects, regionally and nationally.

Failing to bring additional natural gas to the target market, potentially including LNG, would most likely result in short-term natural gas shortages and increased reliance on other fossil fuels (mainly fuel oil and coal) to make up the difference, especially for use in electricity generation. Many natural gas power plants have the option of substituting fuel oil, should natural gas become unavailable or prohibitively expensive. However, there is unlikely to be a surplus of petroleum fuel that could readily provide a cost-effective alternative to natural gas without significant new discoveries of crude oil.

It is possible that existing natural gas infrastructure supplying the target market could be developed in other ways unforeseen at this point, including the further development of the natural gas pipeline system from domestic natural gas producing regions. In some cases, potential customers of natural gas could select available energy alternatives such as oil, coal, wind, solar, hydro, or biomass, to compensate for the reduced availability of natural gas. It is purely speculative to predict the resulting measures that could be taken by the end users of the natural gas supplied by the proposed Project and the associated direct and indirect environmental impacts. However, each of these alternative approaches to meeting the energy needs of the target market would result in some level of environmental impacts. Considered individually, specific energy alternatives or conservation measures would not provide the projected energy needs or reliability required by the target market. These are further discussed in Section 2.2.3.

2.2.3 Energy Alternatives

2.2.3.1 Alternative Energy Sources

Non-Renewable Fuels

There are several non-renewable sources of energy that could be used to meet the lower New York and Long Island market's energy needs. These sources would include gas, coal, oil and nuclear. Increased gas production from tight and shale formations have resulted in increased demand for gas to support fast growing industrial uses and energy consumption. Shale gas production increased from 11 percent of overall U.S. gas production in 2008 to more than 20 percent in 2010 and is projected to approach 50 percent by 2035 (EIA 2014). Although recent developments (fracking) have resulted in the increase in domestic natural gas, the target market does not have sufficient pipeline infrastructure to transport this additional supply to the end users. Failure to provide additional natural gas to the target market, especially during peak periods, could result in price volatility and shortages. Alternative arrangements to obtain natural gas would require construction of new LNG import or natural gas pipeline facilities in other locations. If such facilities were approved and constructed, each would result in its own set of specific impacts.

United States domestically sourced gas is not an alternative energy source for the Port Ambrose project. The purpose of this proposed project, as stated in the application, is to supplement U.S. domestic supplies delivered through existing land-based pipelines with natural gas from foreign sources. To that end, Liberty's proposed action is to construct and operate a deepwater port that would serve as a tolling-station where foreign-sourced LNG would be brought by ship, regasified, and delivered to the offshore Transco Pipeline. For this reason, US domestic sourced gas falls outside the scope of this application and is not carried forward for further consideration.

Fuel oil and coal, though a reasonable alternative to natural gas, have a higher output of air pollutants than natural gas. These pollutants (sulfur oxide [SO_x], carbon dioxide [CO_2], and other greenhouse gases) would decrease air quality in the region and would result in secondary impacts associated with their production (coal mining and oil drilling), transportation (oil tankers, rail cars and pipelines) and refinement. Natural gas produces approximately one-third less carbon emissions to produce the same energy as crude oil and approximately one-half of the carbon emissions associated with coal. Natural gas is also a smaller contributor to greenhouse gases than fuel oil or coal. With technological advances, it may be possible to reduce harmful emissions created by fuel oil and coal to a level equal to natural gas; however, the costly investments in emission control technology would likely be passed on to the end users, thereby increasing the cost of the energy source.

Electric transmission is another method to provide energy to the lower New York and Long Island markets. The Neptune Cable began operating in mid-2007 and provides approximately 660 megawatts of electricity to the Long Island area (approximately 20 percent of use). The Neptune Cable taps a variety of power generation methods including wind, hydroelectric, oil, coal, nuclear, and natural gas. The Poseidon project is projected to provide an additional 500 megawatts of electricity to the New York power grid and is designed to replace energy typically obtained from the Indian Point Energy Center. Both facilities are electric transmission facilities and do not meet the purpose and need of the proposed Project which is to distribute natural gas into the downstate New York City and Long Island markets to meet existing and future demand requirements, particularly during periods of peak winter and summer demand. The proposed Project will provide natural gas to electric generating stations that can, in turn, supply systems such as the Neptune and Poseidon facilities.

Nuclear power development is costly and involves a lengthy permitting process that is not consistent with the purpose and need identified for the proposed Project. In 2010, nuclear electric power comprised about 8 percent of the total energy consumed in the United States (EIA 2012a). There are currently three operating nuclear power plants in the vicinity of the proposed Project; Entergy's Indian Point Nuclear Generating Station, Dominion's Millstone Nuclear Generating Station, and Exelon's Oyster Creek Nuclear Generating Station. Entergy's Indian Point facility currently has two units operating and license renewals were submitted for both in 2007. Dominion's Millstone facility also operates two units, and licenses for these units are set to expire in July 2035 and November 2045, respectively. Exelon has announced that its Oyster Creek facility will be retired at the end of 2019.

While licenses remain active at these facilities, energy generation from these facilities is likely to remain stable. None of these facilities have plans to expand at this time. Regulatory requirements, cost considerations, and public concerns make it unlikely that new power plants would be sited and developed to serve the target market. However, five additional nuclear generating stations in Maryland, New Jersey, New York, Pennsylvania, and Virginia are in the permitting process (NRC 2012a). As of May 2012, none of these five facilities have completed the permitting process and entered the construction phase of the project. In addition to this uncertainty, nuclear facility permitting and construction timelines are long, with the construction of a single reactor taking a minimum of five years. Based on this information, it is unlikely that any nuclear facilities could be constructed or upgraded by late 2016 to serve the proposed Project's purpose and need.

Renewable Energy Source

In 2011, consumption of renewable energy sources in the United States accounted for approximately 13 percent of all energy used nationally (EIA 2012b). The breakdown of that 13 percent is as follows:

- Solar – less than 1 percent
- Geothermal – 3 percent
- Biomass waste – 4 percent
- Biomass wood – 7 percent
- Wind – 23 percent
- Hydroelectric – 63 percent

In 2012, renewable energy capacity in the state of New York comprised approximately 19 percent of New York's total capacity of 39,000 megawatts. Of the 19 percent, 15 percent was provided by hydroelectric power, 3 percent was produced by wind, and 1.0 percent was produced though other renewable energy sources. Data from the New York Independent System Operator (NYISO) indicate that only 3 percent of total capacity for the target market is produced through renewable sources (NYISO 2012).

Several offshore wind facilities have been proposed along the Atlantic Coast, including Cape Wind, Garden State Offshore Energy, Deepwater Block Island Wind Farm, and Fisherman's New Jersey. In addition to these proposals, the Long Island – New York City Offshore Wind Collaborative filed a lease application with BOEM in September 2011. As discussed in Section 2.2.1.3 the proposed Project is located within that 127-square-mile lease area; however, design specifications of the wind farm have not been provided to date. As of 2011, New York's land-based wind capacity totaled approximately 1,348 megawatts, which is approximately 3 percent of the state's land-based wind capacity.

A pilot commercial license was issued by the FERC for the Verdant Power Roosevelt Island Tidal Energy Project in January 2012. Verdant Power plans to develop a one megawatt pilot project in the East Channel of the East River adjacent to New York City. Though Verdant Power plans to expand the capacity in the future, the current technology at this location has not been developed for large-scale production. Therefore, at this time it cannot meet the short-term energy demands that would be met by the proposed Project.

It is anticipated that the nation's total renewable energy supply would decline by about 1.5 percent in 2012 due largely to hydropower resources beginning to return to the long-term average (EIA 2012c). On the other hand, wind-powered generation is expected to grow 13 percent in 2012 from 2011 levels and an additional 5 percent in 2013. The slower increase is likely due to the fact that federal production tax credits for wind-powered generation are not available for turbines that began operating after the end of 2012 (EIA 2012c). Wind power, like solar, is intermittent and cannot be scheduled based on demand. Therefore, it is likely that during times of peak energy needs, these sources would not be available to provide the additional energy required.

2.2.3.2 Energy Conservation Alternatives

Energy conservation measures will likely continue to play an increasingly prominent role in offsetting the target market's increasing energy demand. Several programs have increased energy efficiency in the Northeast, including the conversion of residential, commercial, and industrial heating and appliance applications from electricity (often produced by coal or oil) and oil to natural gas. In addition, the New York State Energy Research and Development Authority offers a wide range of programs for residents and businesses to become more energy-efficient.

Although energy conservation measures will be important elements in addressing future energy demands for the target market, energy conservation will reduce the energy demands of the target market by only a small fraction for the foreseeable future. The Reliability Needs Assessment for New York, conducted in September 2012, by NYISO, states that statewide energy use dropped a total of 5.1 percent in 2008 and 2009, primarily due to the downturn in the economy (NYISO 2012). However, energy use resumed growth by 3 percent in 2010 with only a slight downturn in 2011. According to NYISO (2012), only through the achievement of very significant energy efficiency measures (meeting 15 percent of New York's projected electricity demand in 2015 through energy efficiency) would annual energy forecasts could be expected to decrease over 10 years. Despite efforts to meet then-Governor Eliot Spitzer's 2008 goal of reducing energy usage 15 percent by 2015 (the "15 by the 15" policy), the Pace Energy and Climate Center (PACE) has indicated that New York is not on track to meet this goal (PACE 2012). The economic downturn, coupled with other causes such as lack of cooperation among program administrators, counterproductive incentive mechanisms, fuel restrictions and other eligibility restrictions have contributed to energy efficiency shortfalls (PACE 2012). Therefore, energy conservation would not replace the need for the proposed Project.

2.2.3.3 Alternative Gas Supply Systems

Multiple LNG import terminals and natural gas pipeline systems exist or have been proposed that could serve the New York region. Although some of these proposed projects could satisfy some of the target market, they are not considered to represent true alternatives to the proposed Project because they would serve different markets, and each could be constructed and operated regardless of the outcome of the proposed Project DWPA Application.

Five existing natural gas pipelines and four existing LNG terminals and deepwater ports are currently located within the New York region or along the East Coast. Two additional LNG import terminals have been approved by the FERC or currently have an application filed with the FERC. There are other existing or proposed natural gas pipelines and LNG terminals in other parts of North America, including the Mid-Atlantic market. However, these are not considered alternatives as their location, in combination with the existing interstate pipeline infrastructure, would not provide reasonable access to the lower New York and Long Island market, which is the target market of the proposed Project.

Natural Gas Pipeline Systems

Five existing interstate pipelines are located in the ROI, including Transco, Texas Eastern Transmission Company (TETCO), Algonquin Gas Transmission LLC (Algonquin), Tennessee Gas Pipeline Company, and Iroquois Gas Transmission System (Iroquois). Of these, two (Transco and Iroquois) have expansion projects that would deliver additional supply of natural gas to the target market, and one (TETCO/Algonquin) recently completed an expansion project. However, none of these projects would provide a new, diverse peak supply.

The Transco Rockaway Delivery Point Project consists of 3.2 miles of 26-inch-diameter pipeline coming off its existing 26-inch Lower New York Bay Lateral. Designed to provide approximately 647,000 dekatherms per day of natural gas, the project will provide additional service to National Grid NY and KeySpan Gas East Corporation in Queens County, New York. Transco states that the project will “enhance reliability and position National Grid to serve growth by providing an additional delivery point into their system…[and]… allow existing natural gas supplies to be shifted on Transco’s system and provide a conduit for the delivery of incremental supplies in order to increase the availability of natural gas to the New York market through a tie-in with National Grid” (Transco 2009). Transco filed with FERC in January 2013, and FERC issued a final EIS in February 2014. The project is under construction with an estimated in-service date of November 2014.

Iroquois has proposed their Eastern Long Island (ELI) Project consisting of a marine lateral from the existing Iroquois pipeline in Long Island Sound to a landing point in Shoreham, New York and an on-shore extension to interconnect with Caithness power plant and potentially the National Grid in Yaphank, New York. Designed to meet the growing demand for natural gas and improve energy infrastructure reliability in eastern Long Island, New York, the ELI has an estimated in-service date of 2017. A filing with FERC has not yet been submitted.

In November of 2013, TETCO and Algonquin, subsidiaries of Spectra Energy Corporation, completed the New Jersey-New York Expansion Project, an approximately 20-mile pipeline designed to bring 800 million cubic feet per day of natural gas to the region. Although the completion of this project improves reliability and diversity of gas supplies for the region, demand for natural gas continues to increase.

In addition to the above mentioned pipeline projects, there is a new 100-mile natural gas pipeline proposed by PennEast Pipeline Company, LLC. The pipeline would run from northeastern Pennsylvania to Transco’s Trenton-Woodbury interconnection in New Jersey. This project is still in the early stages of development, and the pipeline is designed to supply inexpensive natural-gas from the Marcellus Shale to the New Jersey market. If given the necessary approvals, construction would begin in late 2017 with an estimated in-service date in late 2018.

Conclusions Regarding Other Natural Gas Pipeline Systems

No existing natural gas pipeline systems could supply the quantities of natural gas to the lower New York and Long Island market as proposed by Liberty without substantially upgrading their facilities or constructing new pipe. Although the Rockaway Delivery Point Project and the ELI Project would deliver additional natural gas to meet market need and location, neither project would introduce a new peak diverse supply. The completion of the New Jersey – New York Expansion Project has improved reliability and diversity of gas supplies in the region; however, future projections indicate a continued increase in demands, requiring further expansion and diversification of the natural gas supply.

Other LNG Import Terminals

There are currently five operating LNG import terminals on the East Coast. Two are deepwater ports along the East Coast, including Northeast Gateway LNG and Neptune LNG, both offshore of Gloucester, Massachusetts. Neptune LNG has recently suspended port operations for a period of five years. The three operating onshore LNG import terminals are Everett, Massachusetts, Cove Point, Maryland, and Elba Island, Savannah, Georgia. In addition, one onshore LNG terminal, Downeast LNG, Robbinston, Maine, has been proposed for construction. None of the terminals are located within the proposed Project's target market.

2.2.4 Alternatives Considered for Detailed Evaluation

As described in Section 2.2.1, a wide variety of alternative locations, designs, and technologies were considered. The majority of the alternatives evaluated would not be operationally or economically feasible, or environmentally advantageous; or would not meet the stated purpose and need. Of the alternatives identified and evaluated, Study Areas C and D are further evaluated in this draft EIS to determine the least environmentally damaging alternative. Study Areas A was removed from further analysis because it did not meet water depth requirements, and Study Area B was removed from further analysis because it had socioeconomic concerns and use conflict associated with a potential Mainline route to Study Area B.

2.3 Identification of the Agencies' Proposed Project

The CEQ regulations indicate that this draft EIS "identify the agency's proposed Project or alternatives, if one or more exists…unless another law prohibits the expression of such preference" (40 CFR 1502.14[e]). Under the DWPA, MARAD has the decision-making authority to approve, approve with conditions, or deny a license application for a deepwater port. Because MARAD is the decision-making authority, identifying its proposed Project could be interpreted as inappropriate prior to the Secretary's assembling, reviewing, and analyzing all of the relevant information pertaining to the License Application, as required under the DWPA. As such, the Secretary will defer identification of the agency's proposed Project until a decision is made to approve or deny a deepwater port license. If the License is approved, the Secretary will indicate the agency's proposed Project in its Record of Decision (ROD) issued under the DWPA.